



## Bioeconomy in the Americas – 2030

Short report

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Brazil

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# **Bioeconomy in the Americas - 2030**

## Short report

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## Introduction

The Center for Strategic Studies and Management (CGEE) has recognized biofuels and bioenergy as absolutely strategic for the progress of the modern bioeconomy, because they provide production and consumption scales capable of accelerating the learning curve that leads to the availability of abundant and competitive raw materials to enable multiple industrial processes generated in biorefineries, with a view to the emergence of the post-oil era (post-fossil fuels in general).

Therefore, in the last years, the Center has developed a series of works around national and international initiatives in the area. The most recent, from 2018, are "Prospect report on second-generation ethanol - E2G 2030 - analytical overview of biofuels and bioproducts" (CGEE, 2018a) and "State of the art of E2G technology in the World - revised and updated edition" (CGEE, 2018b), both mainly based in the application of a survey on advanced biofuels and bioproducts, in support of the Biofuture Platform (BFP) initiative. In 2017 the Center launched at the COP 23 in Bonn, Germany the book "Second-generation sugarcane bioenergy & biochemicals - advanced low-carbon fuels for transport and industry" (CGEE, 2017a). In the same year the report "Panorama of bioeconomy in Brazil and identification of strategic areas" (CGEE, 2017b) provides subsidies for the "Action Plan on Science, Technology and Innovation for Bioeconomy" from the Brazilian Ministry of Science, Technology, Innovations and Communications (MCTIC).

CGEE has been working to identify the opportunities of the low carbon economy by exploring positive climate change agendas through innovations in the field of energy that can contribute to sustainable development. The Center's work on the sustainable development of second generation ethanol (E2G) is being developed within the scope of the project Positive Agenda for Climate Change and Sustainable Development, aiming to support the consolidation of the cellulosic ethanol supply chain as well as its sustainable use as fuel and industrial input, replacing fossil fuels and in support of the advancement of the modern bioeconomy, in the national and global scenarios. The objective of promoting and sharing experiences and best practices on bioeconomy solutions generated by and applicable in the Southern developing countries is to avoid duplicate work and to bring inputs to build capacity in the global South in order to address climate change and to achieve the Sustainable Development Goals.

These works show the importance of adding value to the advanced biofuels production chain with the sustainable use of biomass as a basis for the development of the bioeconomy in a broader way. They reaffirm the growing importance of the bioeconomy in the transition to a circular, renewable and low carbon economy, in line with the Agenda 2030 Sustainable Development Goals (SDG). Also, they corroborate the findings of several recent relevant studies like "Creating the biofuture: a report on the state of the low-carbon bioeconomy",

launched by the Biofuture Platform at the COP 24 in Katowice, Poland, that highlights - in line with International Energy Agency (IEA) models and scenarios, International Renewable Energy Agency (IRENA) and the Intergovernmental Panel on Climate Change (IPCC) - that the diffusion of biofuels and bioproducts plays a central role in the transition to a low carbon economy, together with other complementary efforts to mitigate emissions in all economic sectors.

The present short report “Bioeconomy in the Americas – 2030” is based on the preceding studies achieved by the Center, regrouping the findings related to the American Countries<sup>1</sup> that provide official information to the survey led by CGEE throughout its Insight Survey tool.

### **Modern bioeconomy**

Bioeconomy is the economy based on the production and consumption of goods and products made from biological resources. Modern bioeconomy emerges as a new paradigm of development needed to ensure the sustainable development of life on Earth because it is based on renewable biological resources, the advancement of science and technology, the discovery of new materials and processes capable of regenerating nature and restoring the resilience of ecosystems. It also presupposes an agroecological transition, which reduces the use of inputs, conserves and recovers the soil. Another definition of bioeconomy is given by the European Commission as the production of renewable biological resources and the conversion of these resources and waste streams into value-added products such as food, feed, bio-based products and bioenergy. It comes as a result of a revolution in bio-based innovations that culminate in the development of more sustainable products, processes and services needed for the transition to a low-carbon sustainable economy. Likewise, the internalization of carbon costs would encourage the production and conversion of lignocellulosic raw materials.

The bioeconomy comprises various economic sectors, academic disciplines and policy areas. Agriculture, forestry, fisheries, chemicals, food, biomaterials and bioenergy are different sectors of the economy that produce, process, and re-use renewable biological resources where the bioeconomy could be grouped into (Fuentes-Saguar, Mainar-Causapé, & Ferrari, 2017). There is a growing demand for waste reuse and bio-based material recycling - within the concept of a circular economy - and the development of a wide range of high value-added products based on these biomass sources. These products include special biochemical products based on cellulose or lignin, building materials, wood based textiles, bioplastics and many others (constituting the concept of biorefineries).

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<sup>1</sup> Argentina, Brazil, Canada, Mexico, Paraguay, Uruguay and USA.

Forests, plants and marine organisms convert more than 250 billion tons of atmospheric CO<sub>2</sub> into potentially high-value products every year.

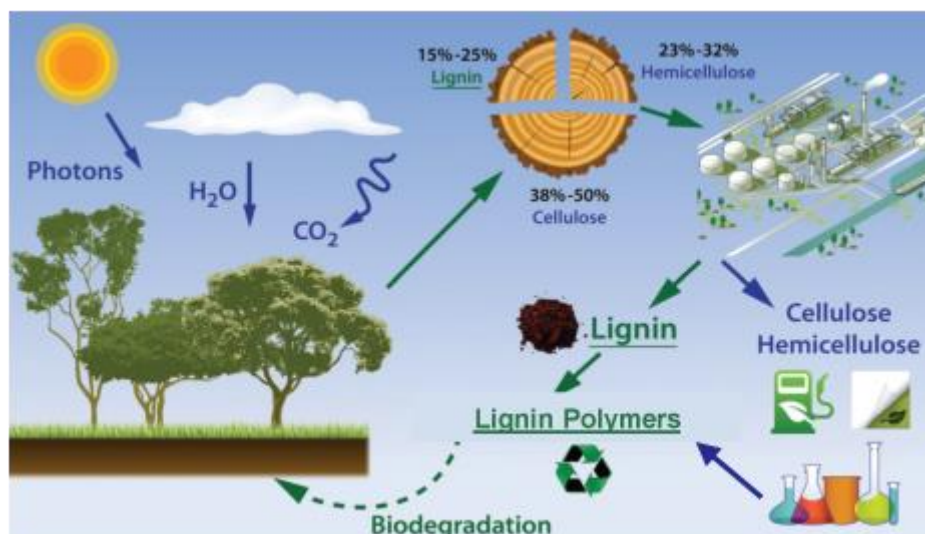


Figure 1 - Schematic life cycle of products derived from biomass. Source: Saito et al, 2012.

Biomass offers an abundant and renewable resource for the sustainable production of bio-derived chemicals, pharmaceuticals, plastics and biofuels as substitutes for current fossil fuel products. Realizing this potential will require the development, demonstration and implementation of a series of innovative processes, biofuels and biomaterials that need to meet demanding performance standards, gathering also strict sustainability criteria.

The expanded bioeconomy, understood as a set of economic activities related to the invention, development, production and use of biological products and processes for the production of renewable energy, materials and chemicals, should be based on sustainable agroforestry practices to ensure an unequivocal reduction of emissions, and to avoid damaging environmental, social or economic negative impacts. An expanded sustainable bioeconomy, respecting biodiversity, can also provide broader environmental, social and economic benefits, replacing fossil raw materials, creating jobs and promoting regional development, in line with the Sustainable Development Goals.

The development of new and innovative technologies around the world is leading to renewable and drop-in fuels, bio-based materials, and renewable chemicals that are replacing fossil-based products.

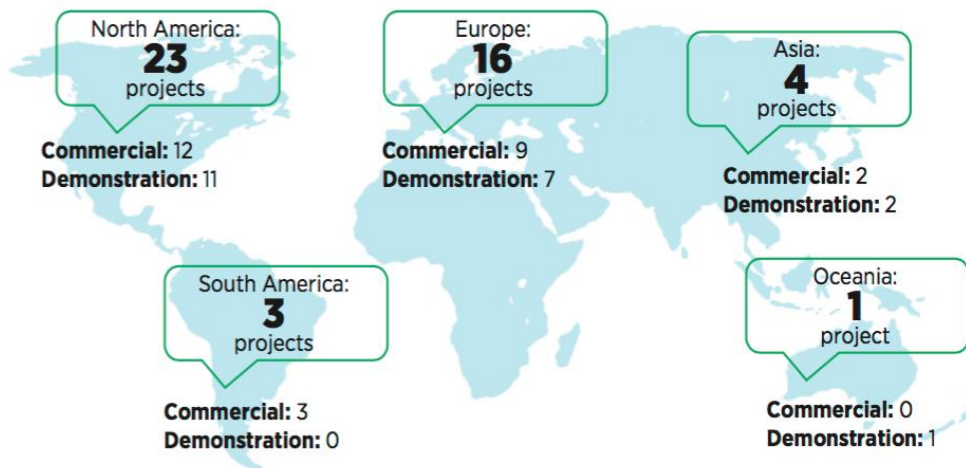
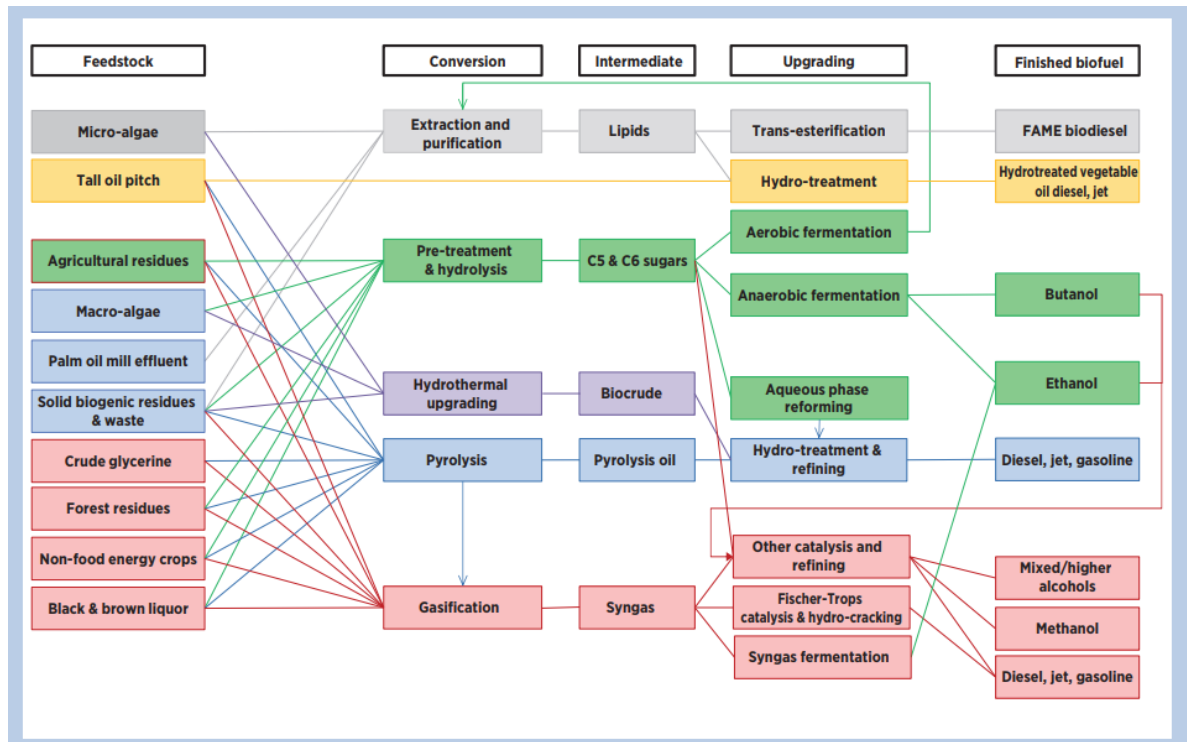


Figure 2 - Commercial and demonstration plants for advanced biofuels by region. Source: Irena, 2016.

Co-production of additives for fuels, chemicals, plastics and cosmetics in units of coupled biorefineries may offset the potential higher initial biofuel production costs. Markets that attract strong industry engagement, such as transport in general and aviation in particular, can stimulate technological progress that may allow the future deployment of advanced biofuels in other markets.



<sup>2</sup>Figure 3 - Technological routes of advanced biofuels. Source: IRENA 2016

<sup>2</sup> Colors represent the main conversion processes of each raw material.



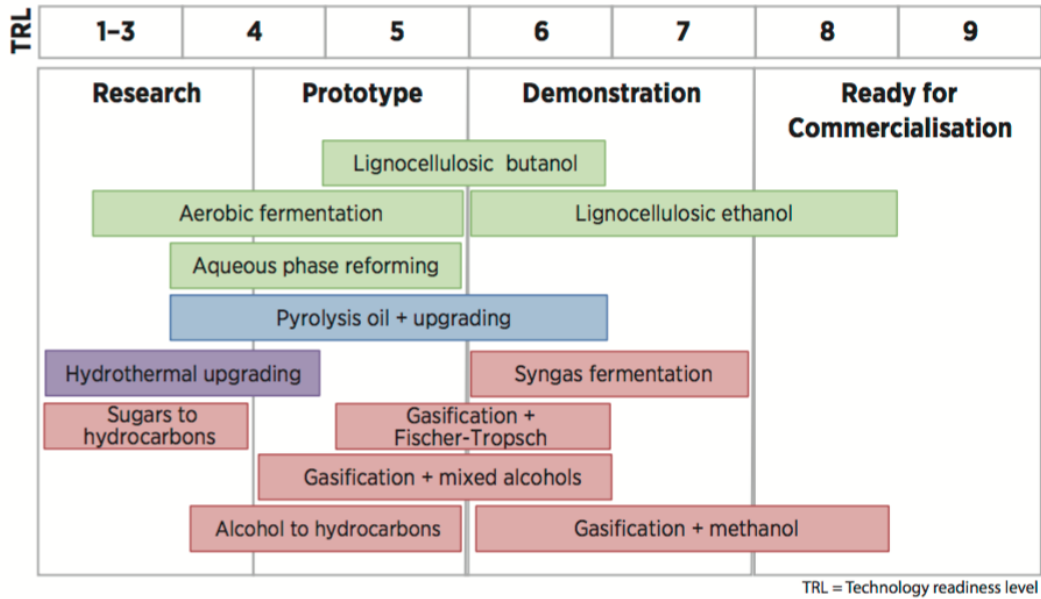


Figure 4 - Status of maturity of several advanced biofuel conversion technologies. Source: Irena, 2016.

Note: Colors represent the main conversion process, hydrolysis (green), pyrolysis (blue), hydrothermal enhancement (purple) and gasification (red).

New applications for ethanol can expand its potential market as an octane booster for highly efficient gasoline engine cars, for example. Thus, biochemicals developed from sugar platforms (biorefineries that decompose biomass into different types of sugar components for fermentation or other biological processing) can be transformed through a biological (eg, ethanol), chemical, intracellular or thermochemical process. Some of these products are shown below.

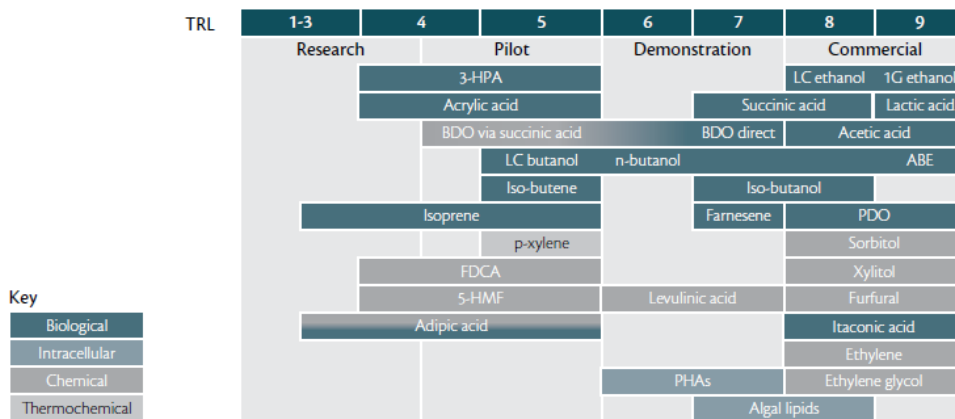


Figure 5 - Stage of technological development of selected sugar platform products. Source: EC-DGE

Likewise, the expansion of biomaterials and biochemicals also requires technologies with more mature TRL.

In order to maintain increased competitiveness, technological development must continue. But other types of innovation, related to regulatory milestones, business models and risk mitigation tools, are also vital to deploy advanced biofuels on the scale needed. Accelerating the deployment of advanced liquid biofuels requires a broad range of support tools related to technology development, business training and energy markets. Market formation through policy incentives, targets or mandates is needed to overcome barriers such as insufficient operational experience, immature supply chains, and uncertain market size.

The Brazilian government in particular has announced targets to expand the use of biofuels in its Nationally Determined Contribution (NDC) to the Paris Agreement, in the framework of the Climate Convention, and intends to implement new dynamics in the sector, notably through the RenovaBio program, led by MME, and the Action Plan in STI for Bioeconomy, conducted by MCTIC. Likewise, other American countries start to build national plans and policies on bioeconomy.

By increasing sustainable and biodiversity respectful use of renewable aquatic and terrestrial biomass resources for biofuels, bioproducts, and biopower, bioeconomy has the potential to stimulate job growth and economic opportunities; promote regional development; support a secure and renewable energy and industrial future; and contribute to improved environmental quality.

Moreover, sustainable bioeconomy will be crucial in the global fight against climate change, nurturing timely solutions in low carbon transport and helping countries to reach their Nationally Determined Contribution targets, as well as contributing towards the Sustainable Development Goals of the Agenda 2030, especially SDGs 7 (sustainable energy), and 13 (action against climate change), while also contributing to SDGs 8 (economic growth and decent work), 9 (industry, innovation and infrastructure), 2 (sustainable agriculture and zero hunger) and 15 (forests and ecosystems). Certainly, synergies and trade-offs can be identified among all the 17 SDGs.

It is essential to promote the exchange of experiences and knowledge on the development and implementation of innovative approaches to remove barriers to expanding the sustainable use of the global abundant biomass resources, while maximizing economic, social, and environmental benefits. For that, it is useful to promote discussion on trends and good practices in, as well as barriers to and enablers of, South-South and triangular cooperation on bioeconomy, including: (i) improve institutional and technical capacities by designing an appropriate policy framework, training in agroecological mapping and zoning, and support in feasibility and awareness-raising studies; (ii) involve the private sector by strengthening research capabilities, supporting supply chain development or by encouraging local content; and (iii) support on key market issues such as distribution logistics or biofuel quality. These are the

drivers of the United Nations Office for South-South Cooperation (UNOSSC) and CGEE initiative, announced during the side-event “Opportunities and challenges of SSC on bioeconomy, in the light of the Paris Agreement and the Agenda 2030, during the Second High-level United Nations Conference on South-South Cooperation (BAPA+40), in Buenos Aires, which will be reflected in a joint publication to be coordinated by CGEE and UNOSSC, and to be launched at COP 25, at the end of the year.

Some regional multilateral leading initiatives are being accomplished in the Americas. The Inter-American Institute for Cooperation on Agriculture (IICA) has newly established its Bioeconomy and Production Development Program, aiming to support the development of policy and regulatory frameworks and inclusive strategies to increase the economic density of territories and the development of value chains of biological resources. One next major contribution will be the “Methodological Guide for the Development of Roadmaps for the Inclusive Use of Bioeconomy Commercial Opportunities in Territories and Value Chains”, in press. The United Nations Economic Commission for Latin America and the Caribbean (ECLAC) has been formally working on bioeconomy since 2015, organizing meetings and launching several publications related to opportunities for agroindustry sector, financing, cooperation and knowledge exchanges on public policy.

Most of CGEE’s works on this field were carried out in coordination with the Biofuture Platform (BFP), global action-oriented, country-led, multi-stakeholder initiative that brings together 20 countries<sup>3</sup>, led by Brazil, launched at COP 22 in Marrakesh in November 2016, with the aim of promoting a modern bioeconomy based on advanced, sustainable, innovative and scalable technologies. BFP has the support of intergovernmental, non-governmental and private organizations of major relevance<sup>4</sup>. The work is also related to the Innovation Challenge in Sustainable Biofuels (SBIC) of the Mission Innovation (MI), launched at COP 21 in Paris, in coordination with the Clean Energy Ministerial (CEM) initiative.

## **Survey on biofuels and bioproducts**

The main source of data and information for this short report comes from the structured consultation conducted throughout the Insight Survey tool from CGEE, to raise the state of the art and prospects of advanced low carbon biofuels and bioproducts. The questions have been elaborated in a participatory manner, with contributions from national and multilateral partner organizations,

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<sup>3</sup> Argentina, Brazil, Canada, China, Denmark, Egypt, Filipinas, Finland, France, India, Indonesia, Italy, Morocco, Mozambique, Netherland, Paraguay, Sweden, United Kingdom, United States of America, Uruguay.

<sup>4</sup> FAO, IEA, IRENA, SE4All, UNCTAD, UNIDO, ABBI, ApexBr, below50, CGEE, WBCSD, WCIB.

resulting to broad acceptance of queries and greater validity of responses. Information gathering includes aspects such as current status and national goals, government policies, consumption, production and trade, land use, support mechanisms, investments, research and innovation. It supplied a rich and unified source of authorized information, provided or verified by countries officials.

For the purpose of the survey, bioeconomy was outlined as the sustainable use of renewable biomass, transformed via biochemical, biological and other industrial scale processes to generate fuels and bioproducts as a low carbon alternative to fossil based counterparts; biofuels were fuels produced directly or indirectly from biological resources as agricultural products, forest, animal and vegetable residues; and bioproducts were products derived from materials of biological origin intended to replace fossil based products, as “drop in” (which replicate the fossil based molecule) or “non drop in” (which can fill the same functions but being different molecules). Bioenergy for electricity generation and heat production remained outside the scope of the survey.

The main finds of the query are shown below in tables and graphs. The questionnaire had also several open discursive questions, but the responses were too heterogeneous and extensive to be properly exploited in a short report, demanding broad analysis, sometime further consultations and careful interpretation.

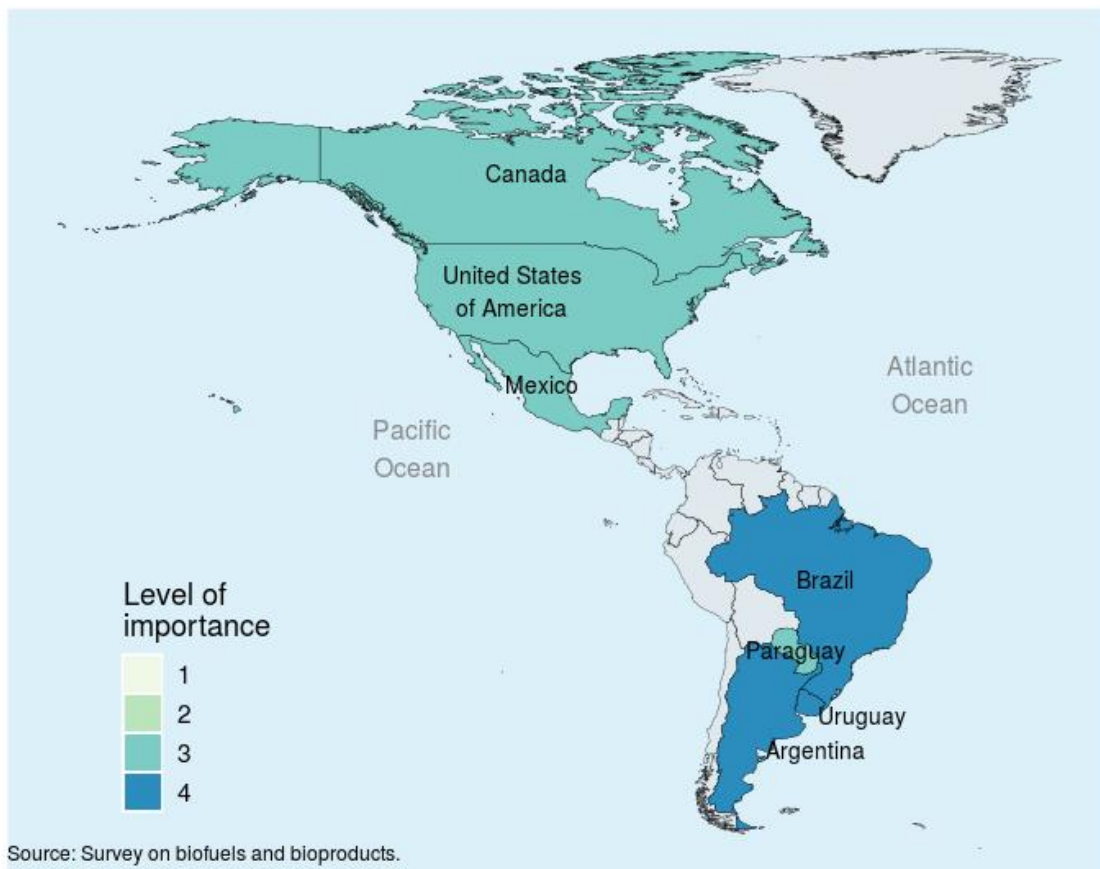
## Exposition of questions and answers

1. What are your country's overall climate policy goals and objectives? (please summarize and insert references to NDC or other national climate measures, giving name of the law, regulation, strategy/date of coming into force/URL).

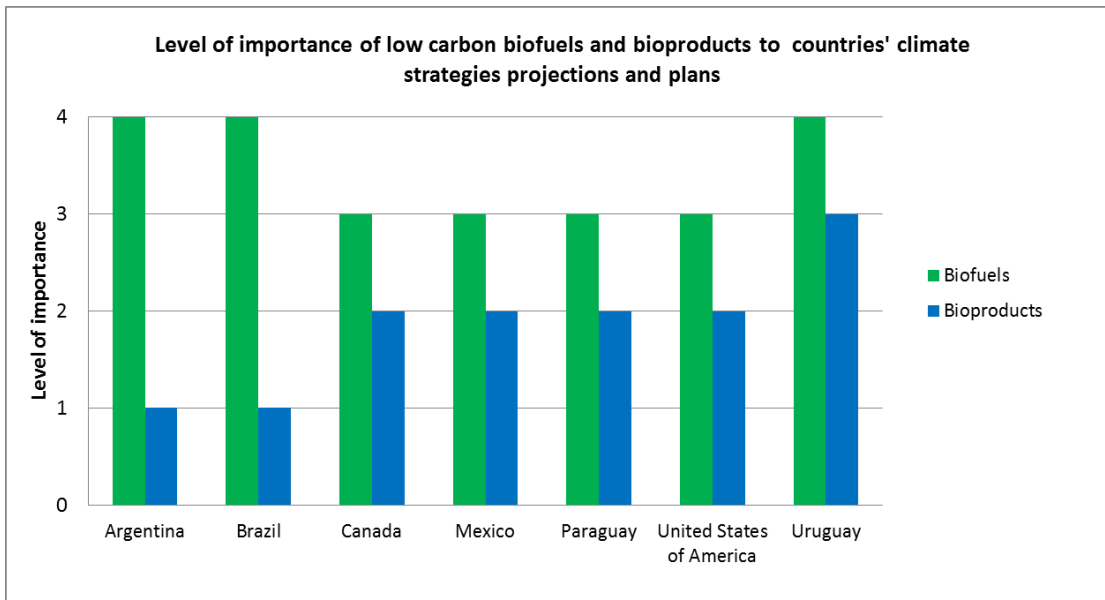
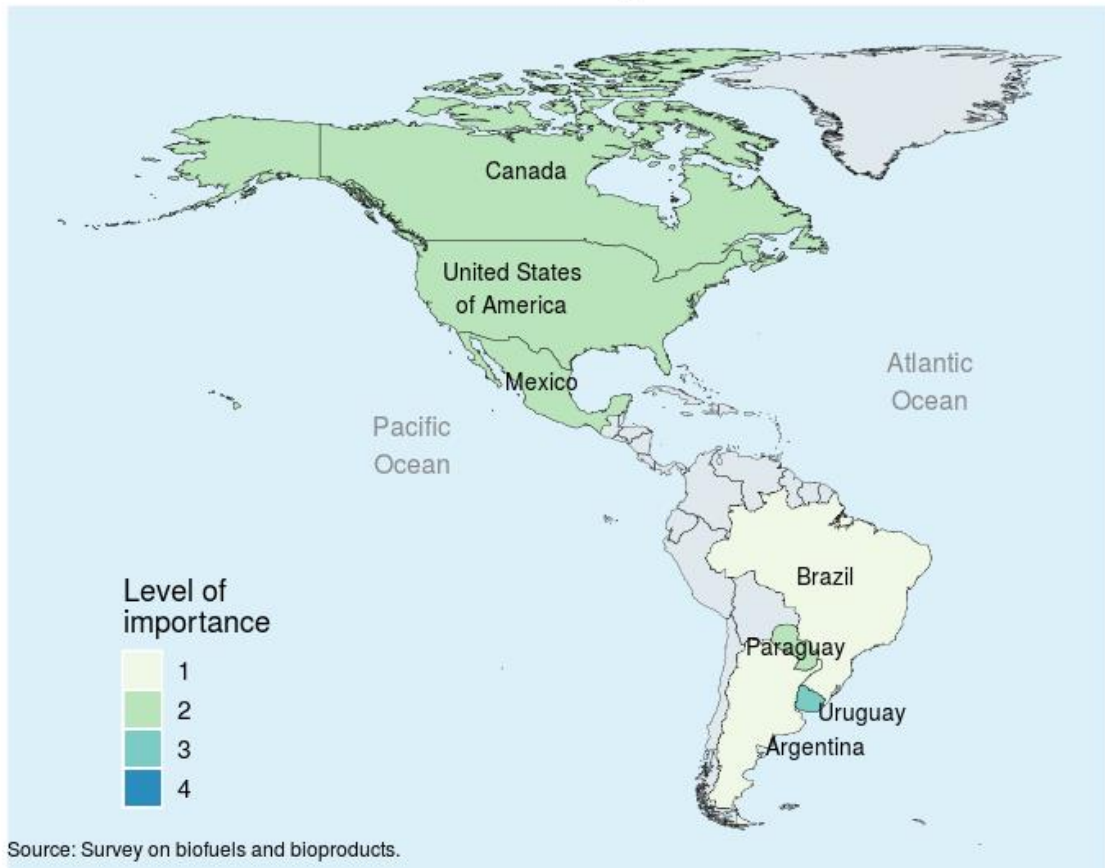
(Open question)

2. What level of importance do low carbon biofuels and bioproducts play in the climate strategies projections and plans of your country? (1irrelevant; 4very important)

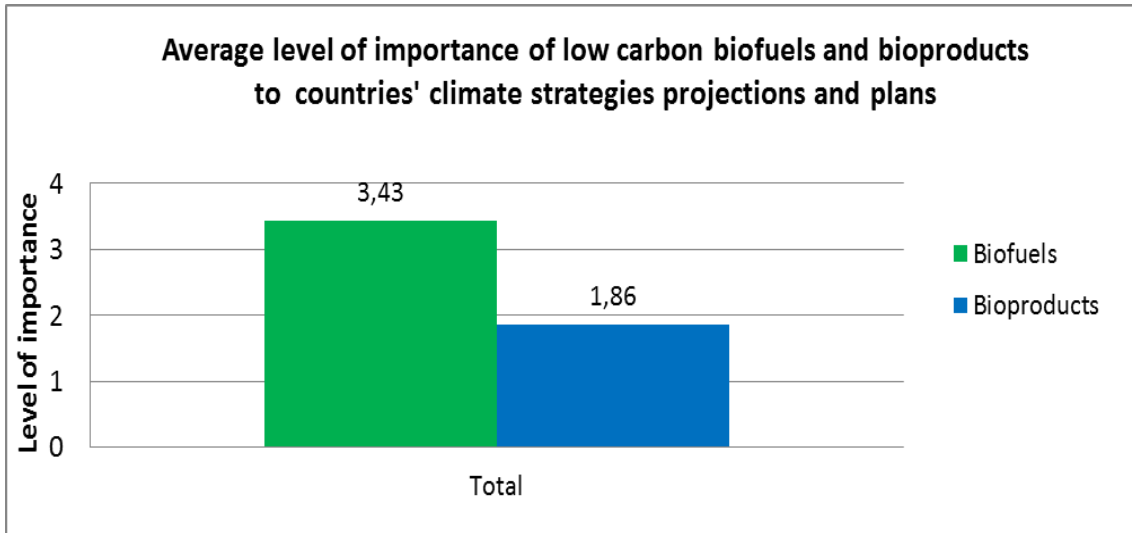
Question 02 - Biofuels



## Question 02 - Bioproducts



Level of importance: 1 - irrelevant; 2 - relevant; 3 - important; 4 - very importante.



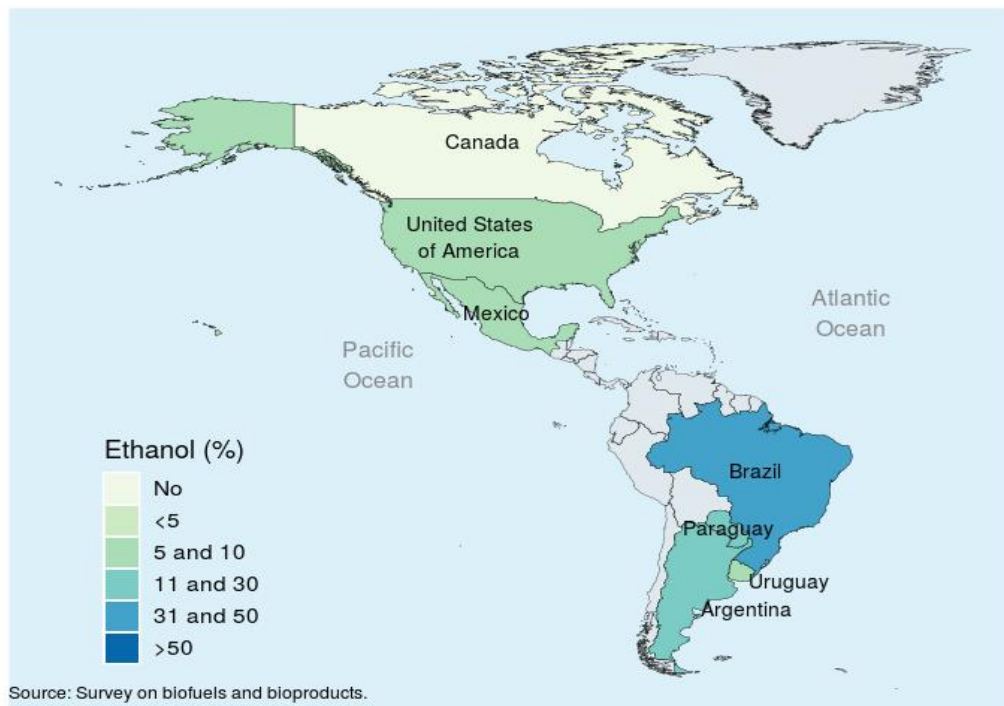
Level of importance: 1 - irrelevant; 2 - relevant; 3 - important; 4 - very importante.

3. What is the share (%) of biofuels in transport sector energy consumption of your country?

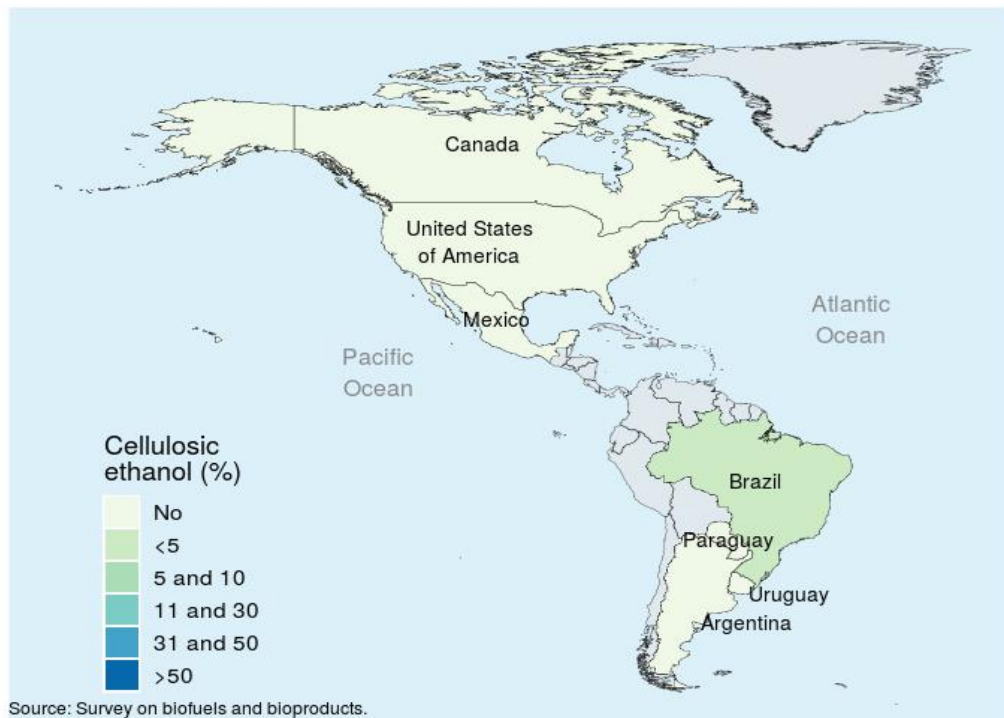
Country	% of biofuels			
	Total	Ethanol	Biodiesel	
ARGENTINA	10%			
BRAZIL	20%	16%	3,3%	36,4% ethanol cycle Otto e 6,99% Biodiesel cycle diesel (2016)
CANADA				6,2% ethanol cycle Otto e 2,2% Biodiesel cycle diesel (2012)
MEXICO				10% ethanol cycle Otto e <5% Biodiesel cycle diesel
PARAGUAY				25% ethanol cycle Otto e 1% Biodiesel cycle diesel
UNITED STATES OF AMERICA	5,1%			2016
URUGUAY	6%	3%	3%	2015

4. Does your country have specific targets for low carbon biofuels in the transport sector by 2030? If so, what is the percentage in the national market? (volume)

Question 04 - Ethanol

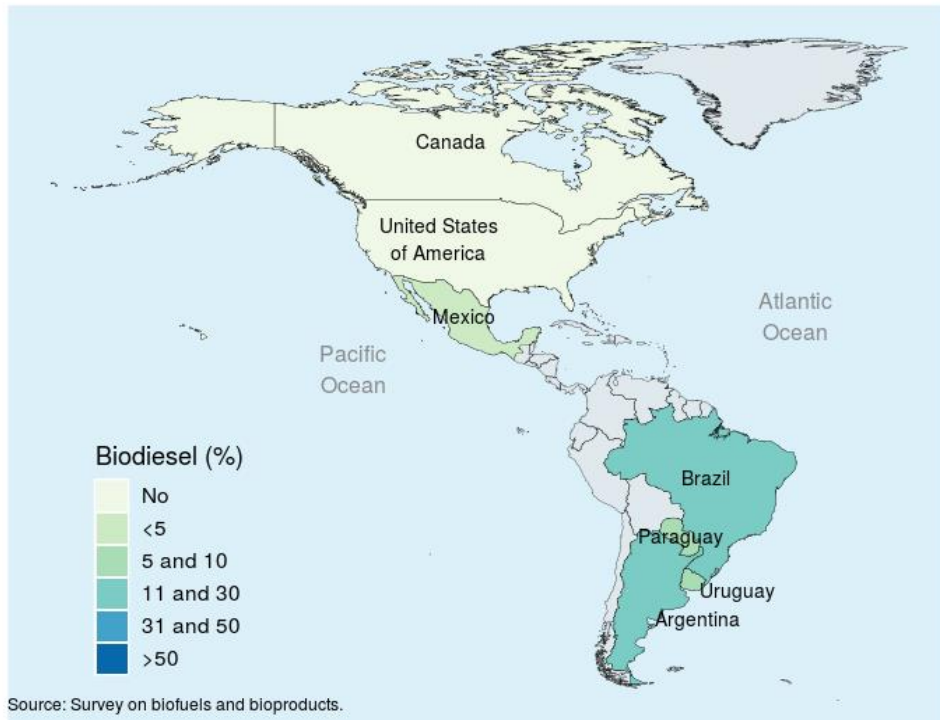


Question 04 - Cellulosic ethanol





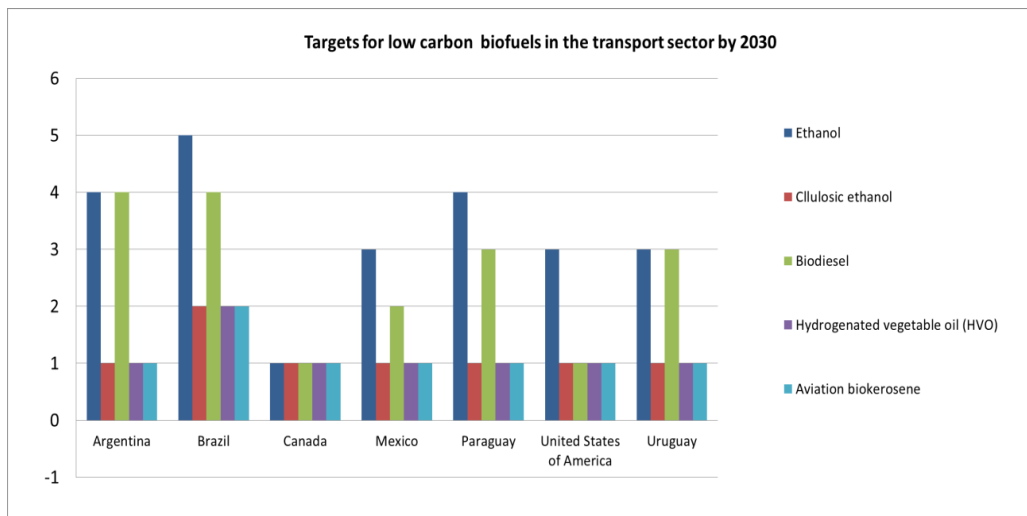
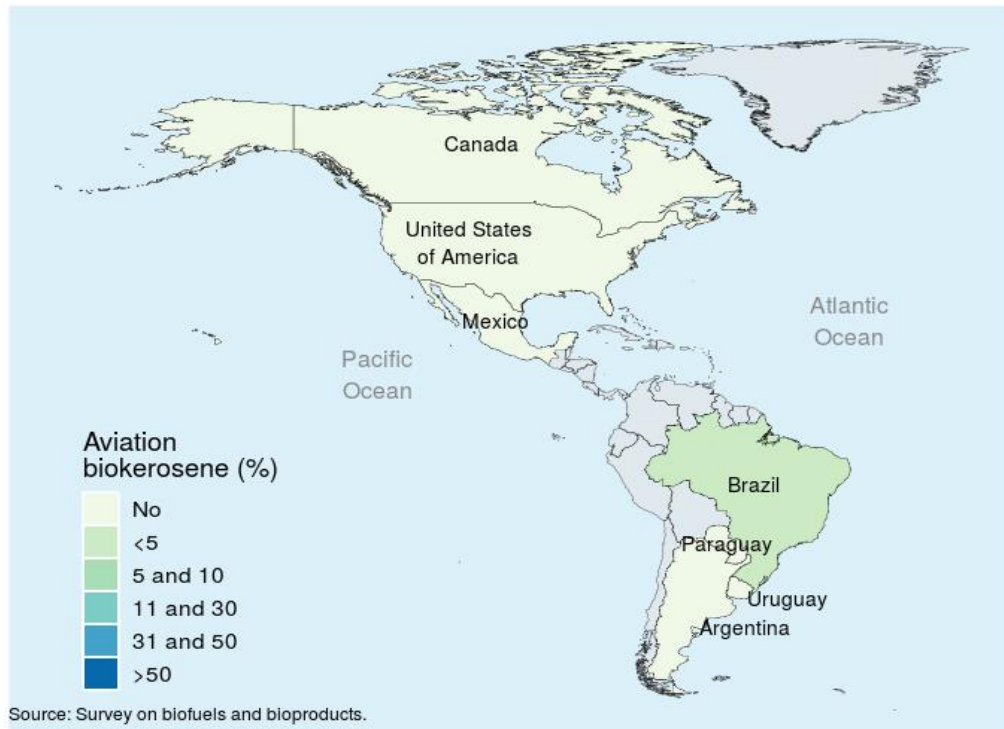
### Question 04 - Biodiesel



### Question 04 - Hydrogenated vegetable oil (HVO)



### Question 04 - Aviation biokerosene



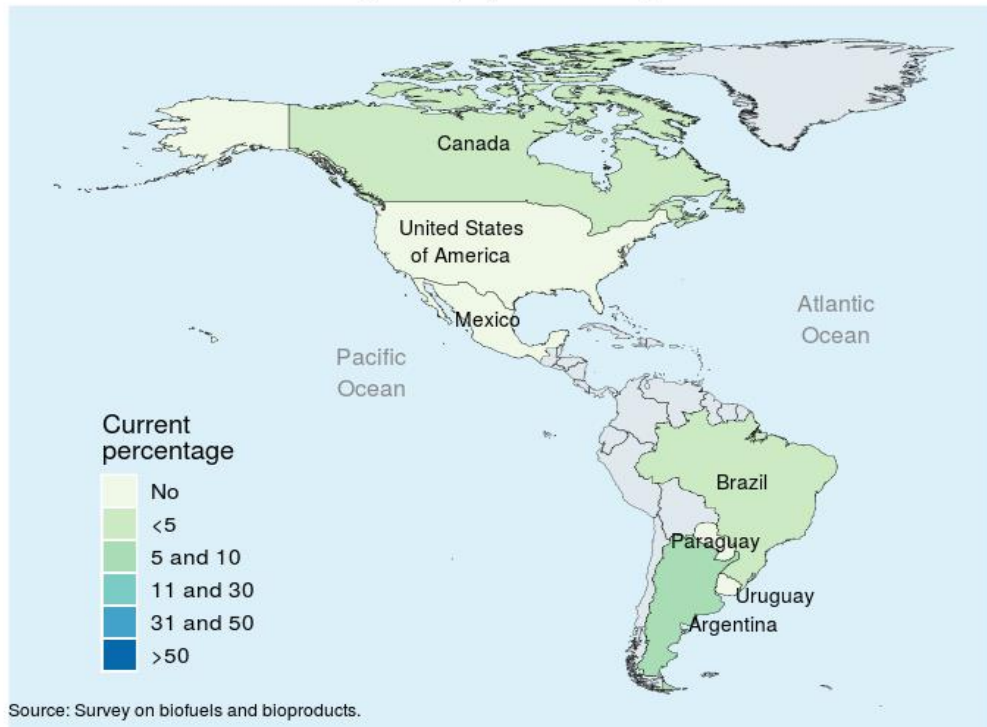
1-there isn't; 2 - <5%; 3 - 5% to 10%; 4 - 11% to 30%; 5 - 31% to 50%; 6 -> 50%; negative - did not respond.

If others, provide reference.

(Open question)

5. Does your country have figures for the market of bioproducts? If so, what are the current percentage of bioproducts in your national market? (volume)

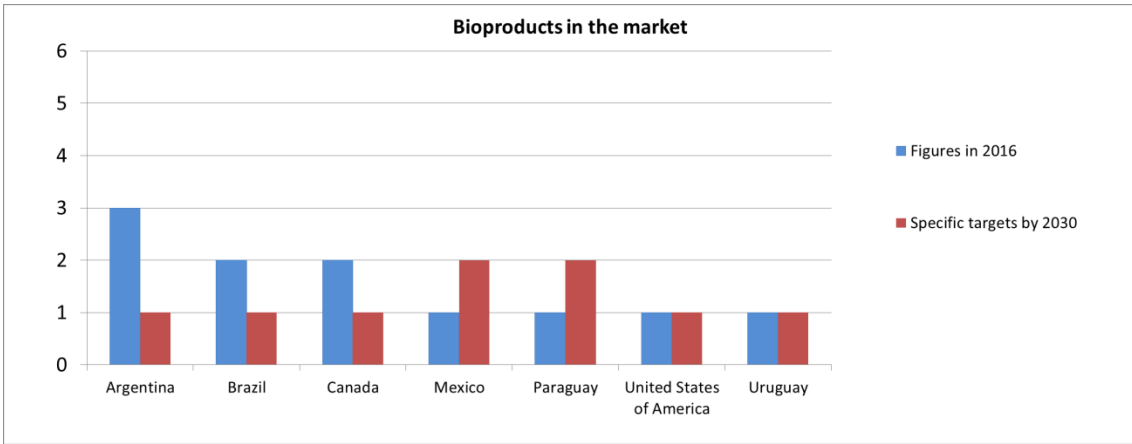
Question 05 - Figures (%) for the bioproducts market



6. Does your country have specific targets for bioproducts by 2030? If so, what is the percentage in the national market? (volume)

Question 06 - Specific targets for bioproducts until 2030

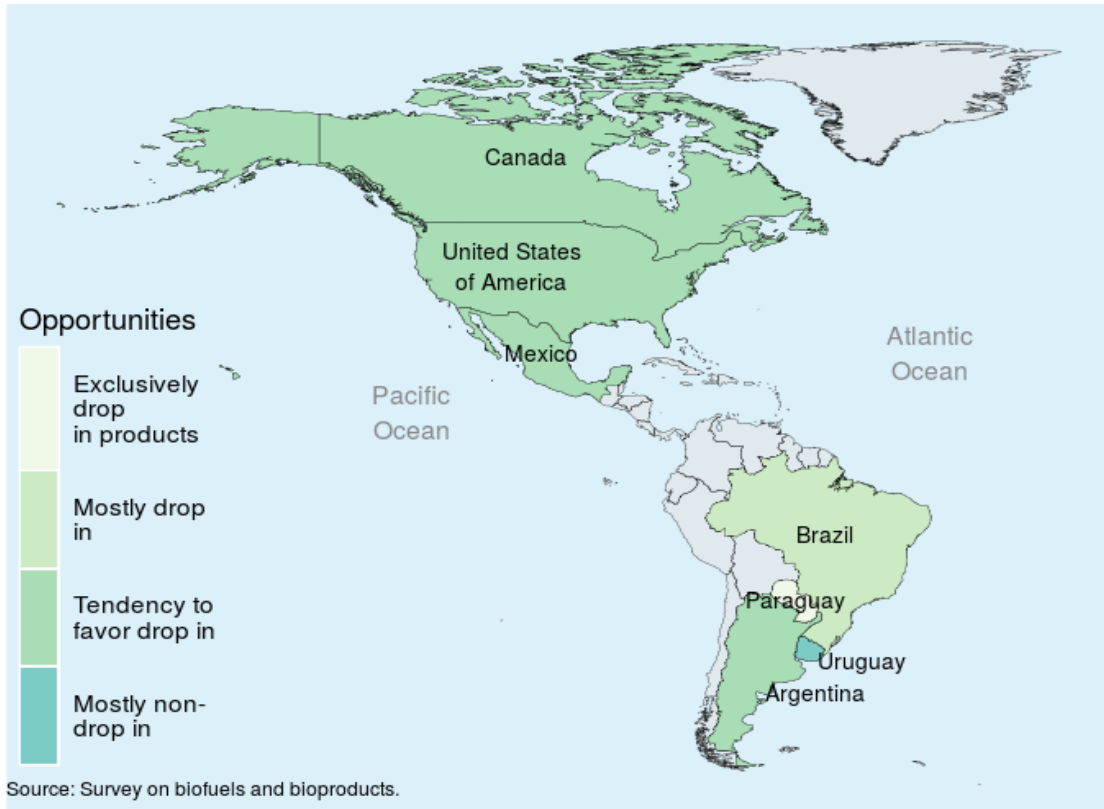


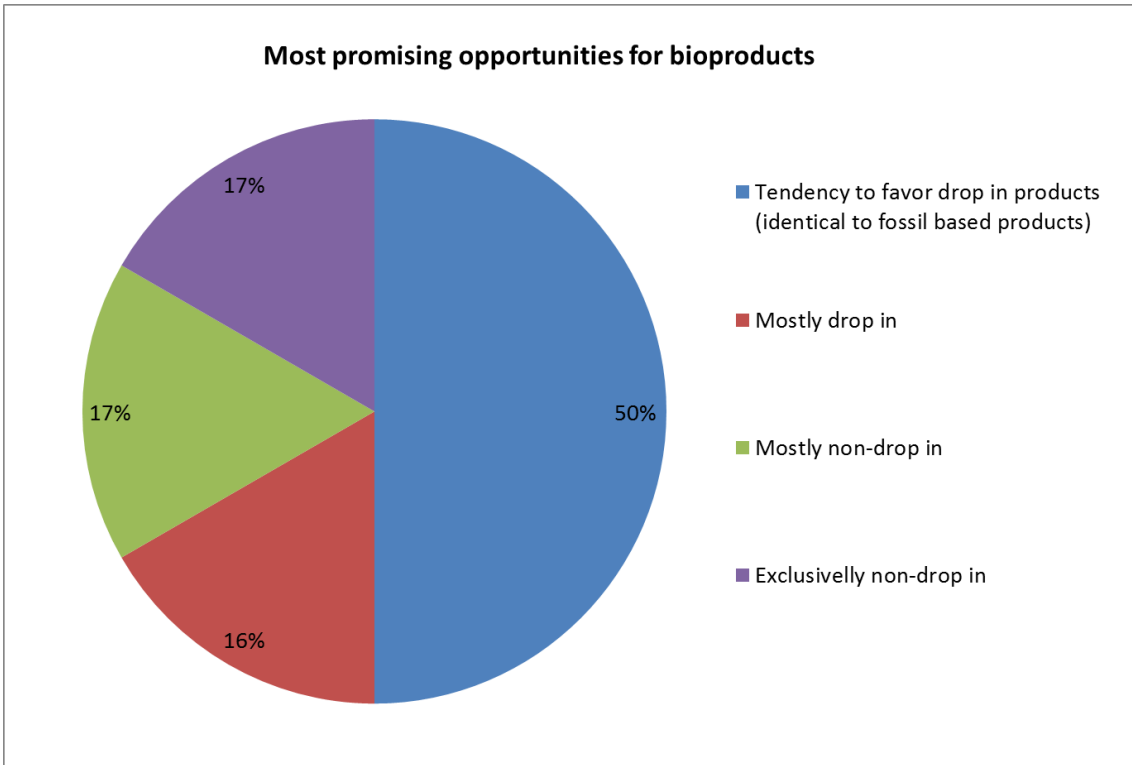


1- there isn't 2 - <5%, 3 - 5% to 10%, 4 - 11% to 30%, 5 - 31% to 50%, 6 -> 50%, negative - did not respond

7. What are the most promising opportunities for bioproducts in your country?

Question 07 - Most promising opportunities for bioproducts in your country

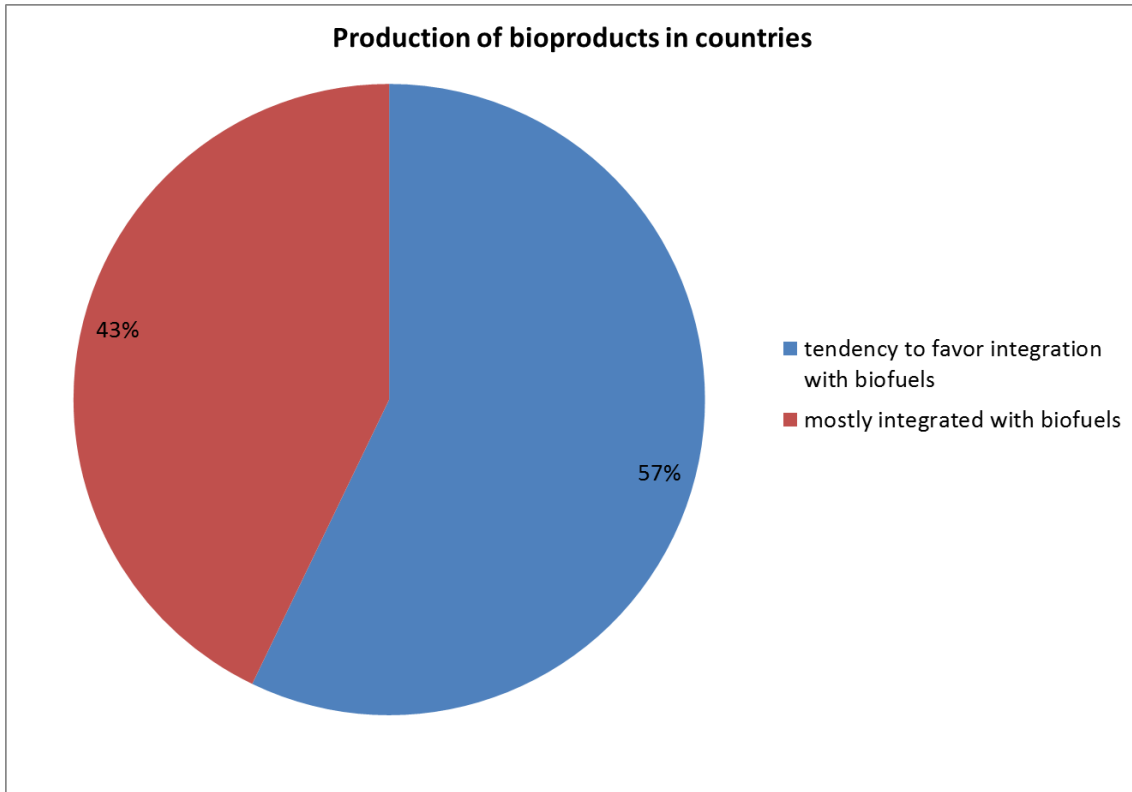




8. How are bioproducts produced in your country?

Question 08 - How are bioproducts produced





9. Does your country have regulations concerning the specification of biofuels?

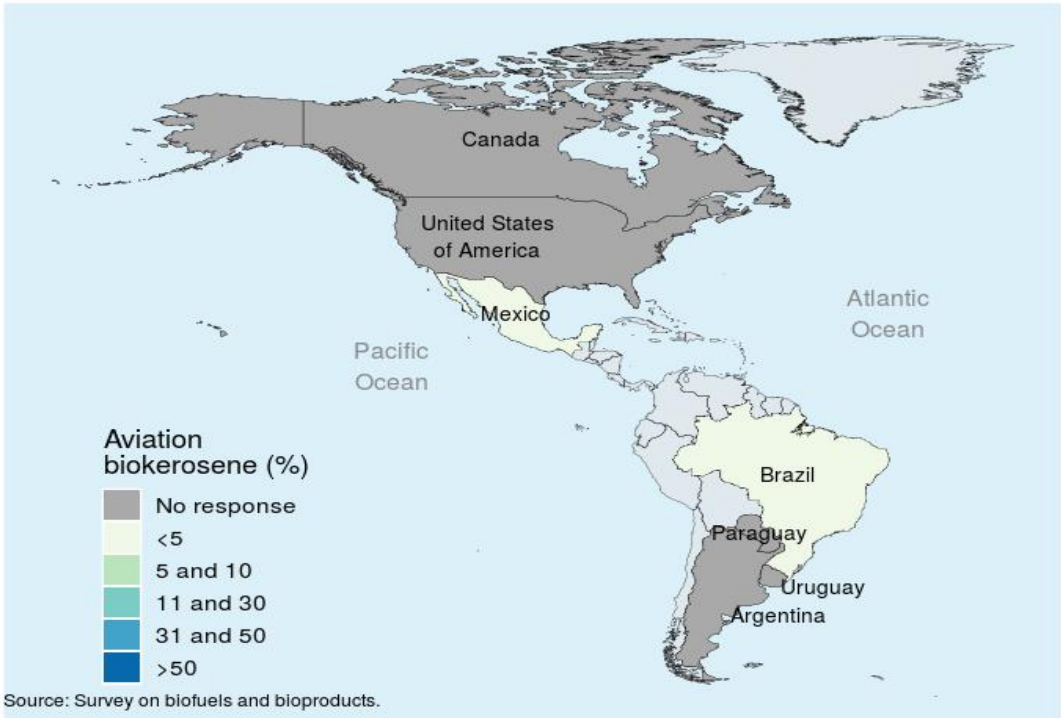
Country	Ethanol		Biodiesel		Hydrogenated vegetable oil (HVO)		Aviation biokerosene		Others	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
ARGENTINA		X		X	X		X			X
BRAZIL		X		X	X		X			X
CANADA		X		X	X		X			
MEXICO		X		X	X			X		X
PARAGUAY		X		X	X		X			X
UNITED STATES OF AMERICA		X		X		X		X		X
URUGUAY		X		X	X		X			X
<b>Total</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>7</b>	<b>6</b>	<b>1</b>	<b>5</b>	<b>2</b>	<b>5</b>	<b>1</b>

If so, summarize and provide reference. (name of the law, regulation, strategy/date of coming into force/URL).

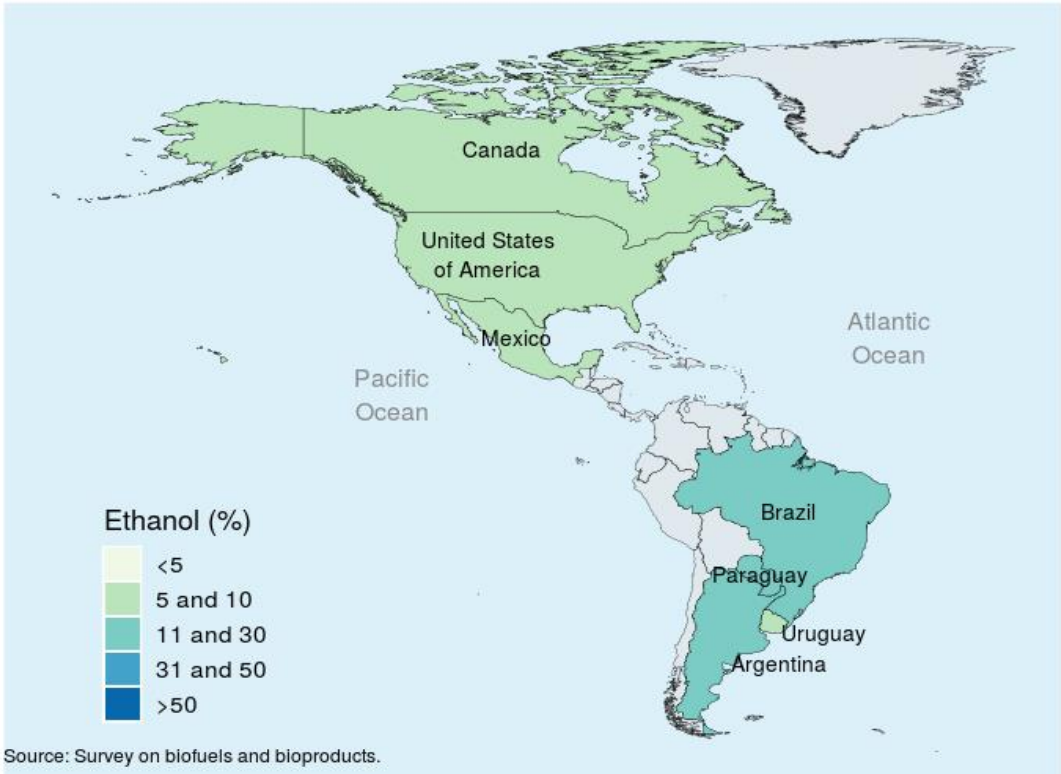
(Open question)

10. Does your country have regulations concerning the blends of biofuels?

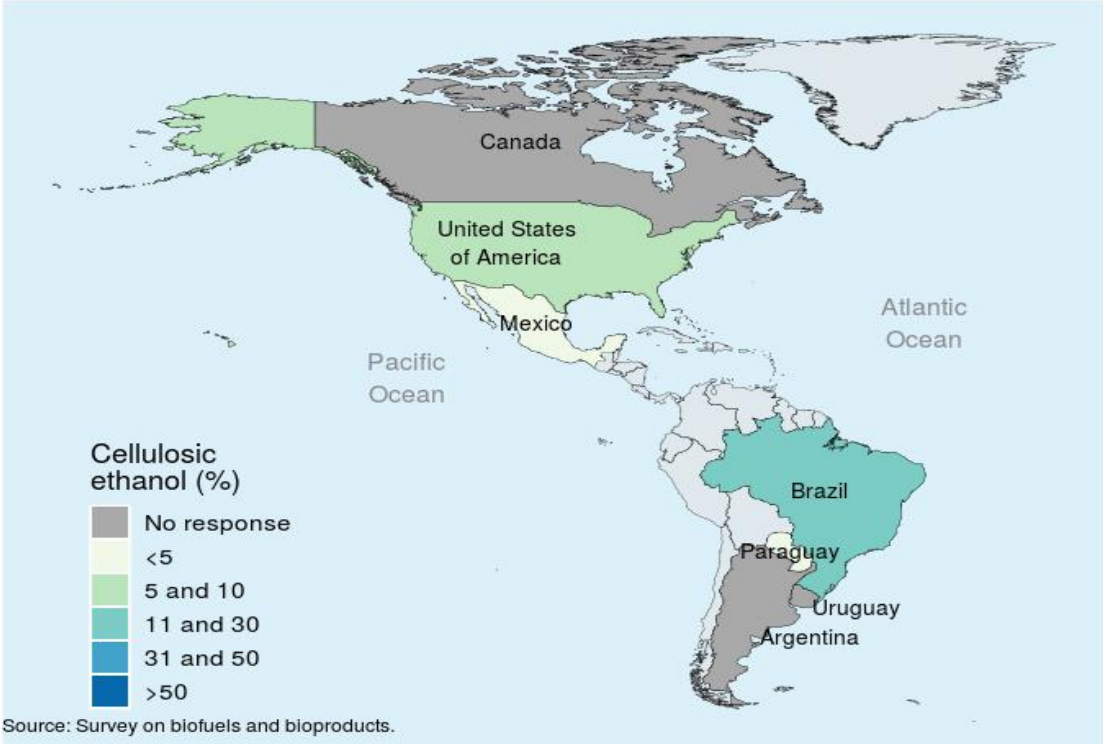
Question 10 - Aviation biokerosene



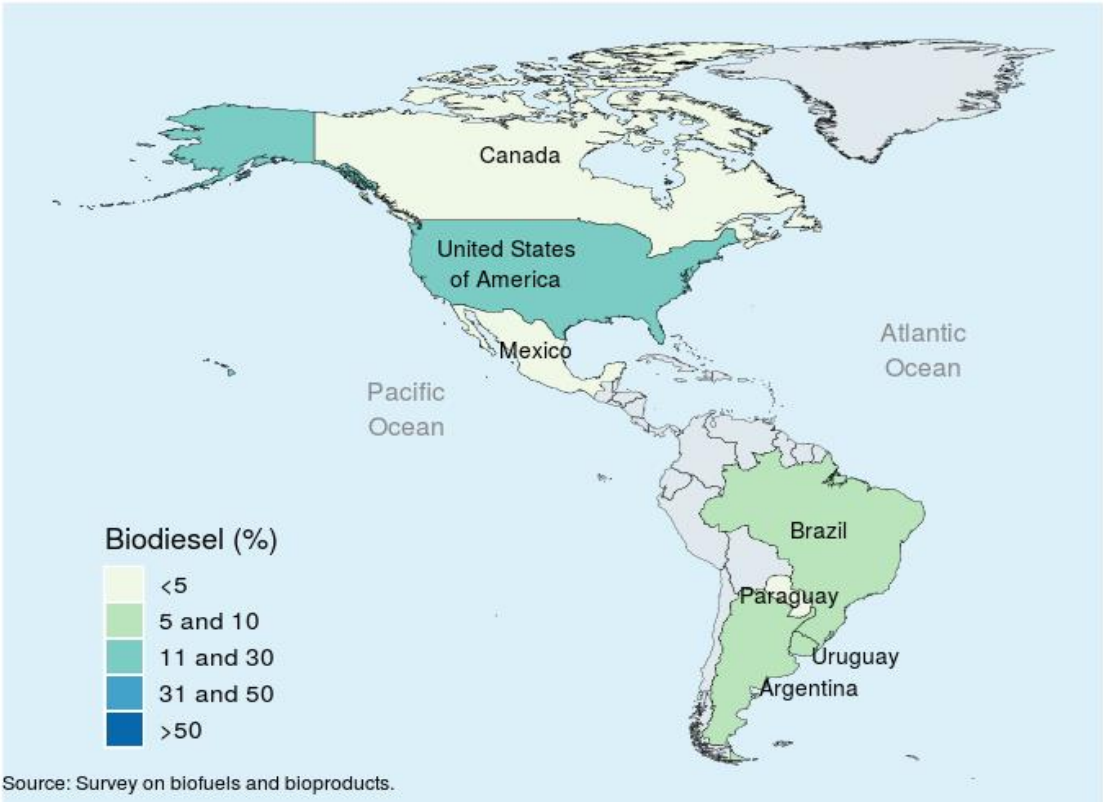
Question 10 - Ethanol



Question 10 - Cellulosic ethanol

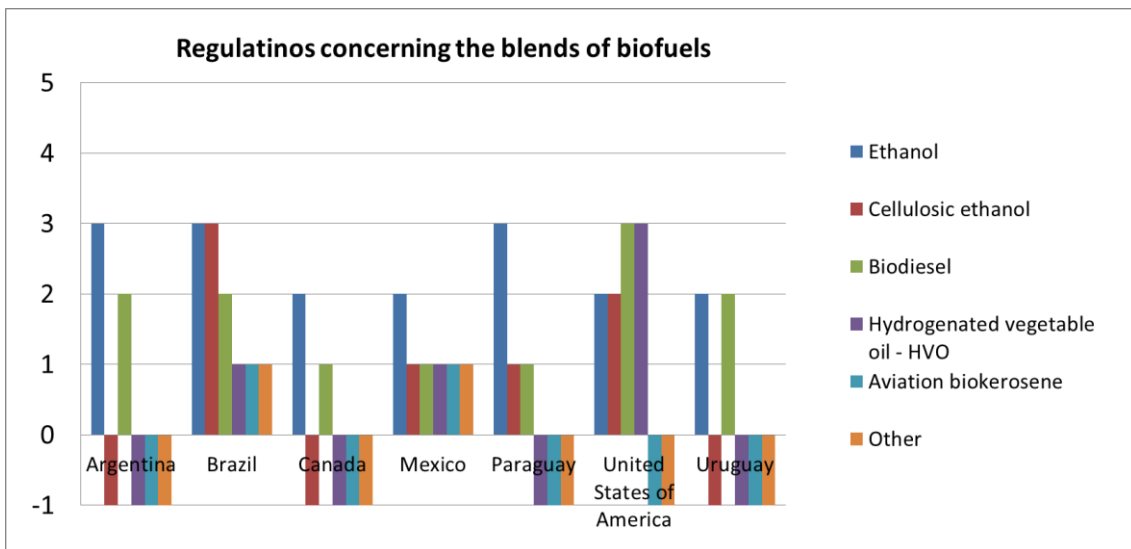
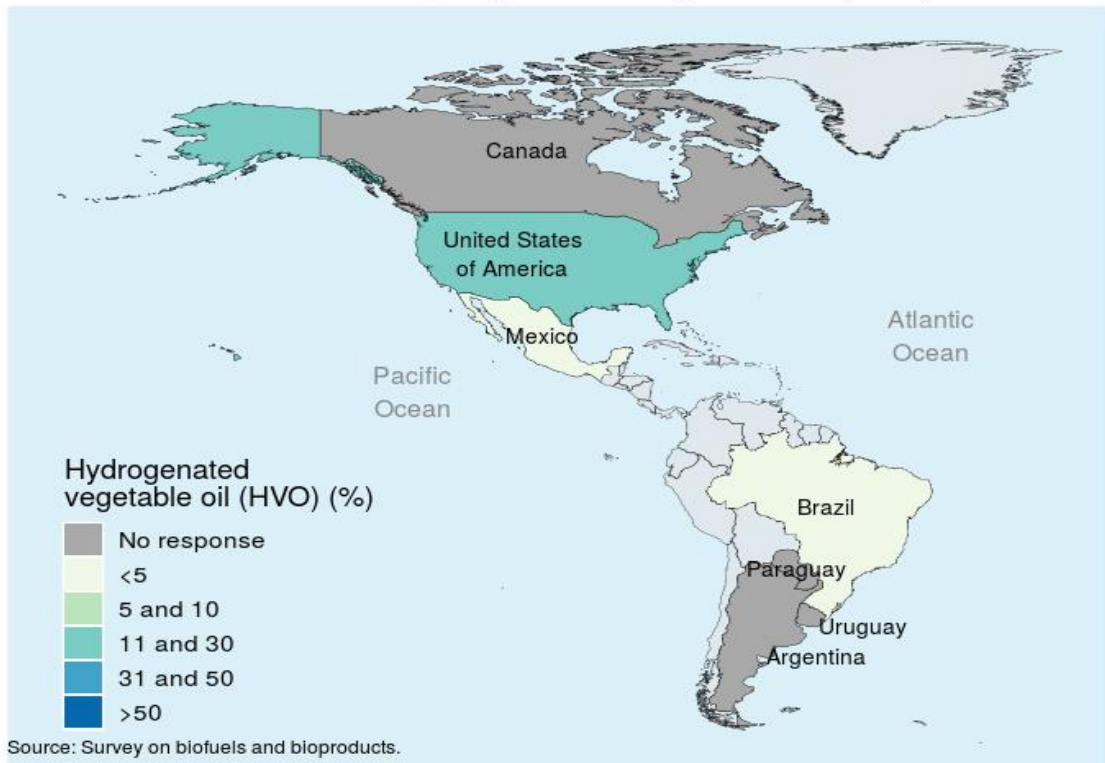


Question 10 - Biodiesel





### Question 10 - Hydrogenated vegetable oil (HVO)



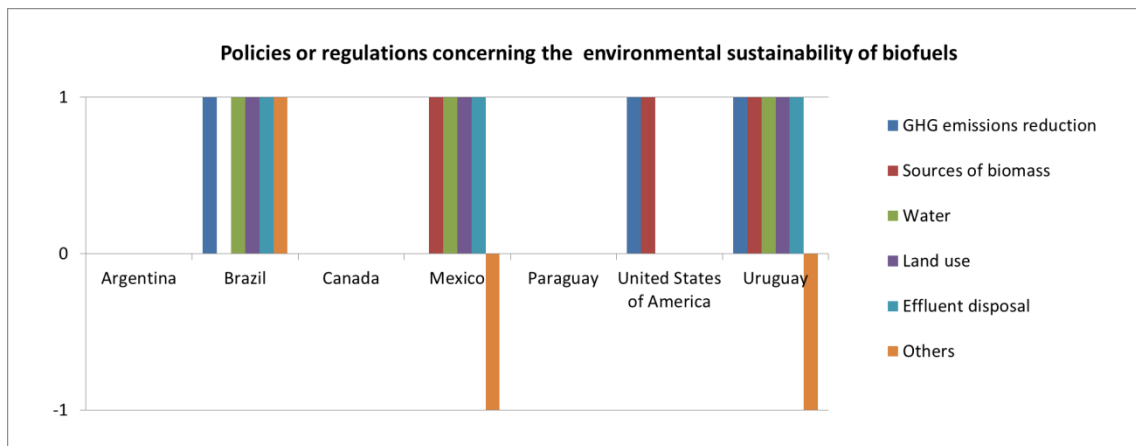
1-there isn't; 2 - <5%; 3 - 5% to 10%; 4 - 11% to 30%; 5 - 31% to 50%; 6 - > 50%; negative - did not respond.

If so, summarize and provide reference to every level of biofuel blend (name of the law, regulation, strategy/date of coming into force/URL).

(Open question)

11. Does your country have policies or regulations concerning the environmental sustainability of biofuels?

Country	GHG emissions		Sources of biomass		Water		Land use		Effluent disposal		Others	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
ARGENTINA	X		X		X		X		X		X	
BRAZIL		X	X			X		X		X		X
CANADA	X		X		X		X				X	
MEXICO	X			X		X		X		X		
PARAGUAY	X		X		X		X		X		X	
UNITED STATES OF AMERICA		X		X	X		X		X		X	
URUGUAY		X		X		X		X		X		
<b>Total</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>1</b>

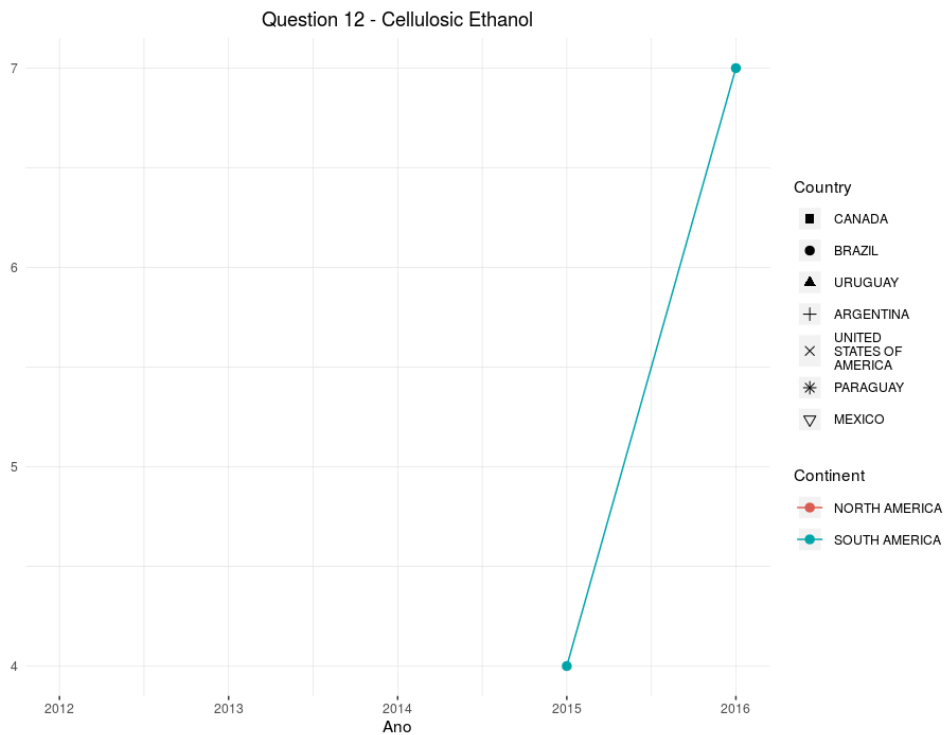
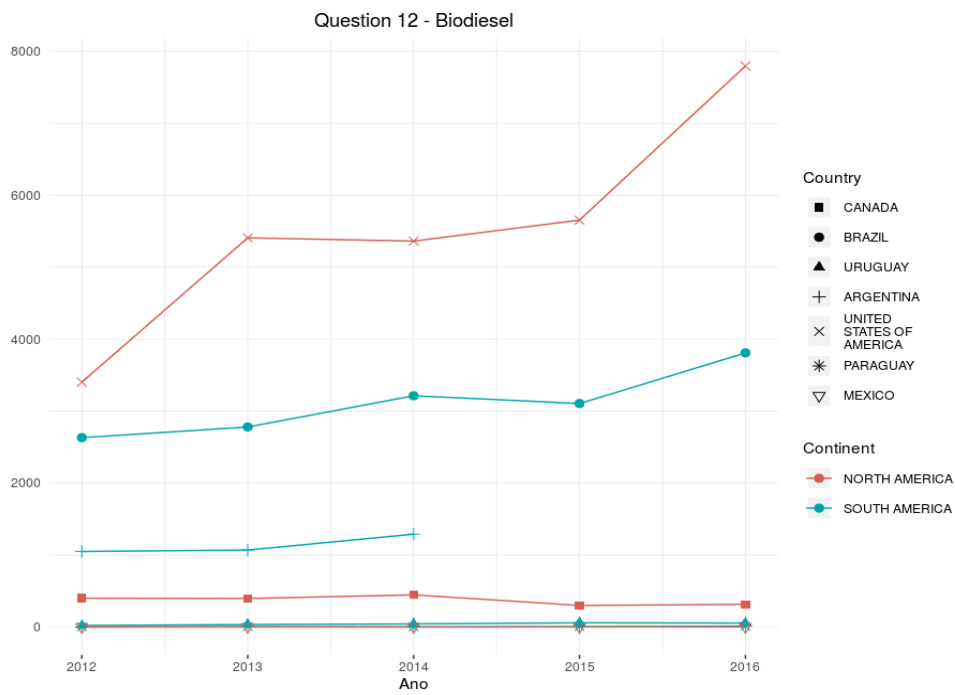


0- No; 1- Yes; -1 did not respond

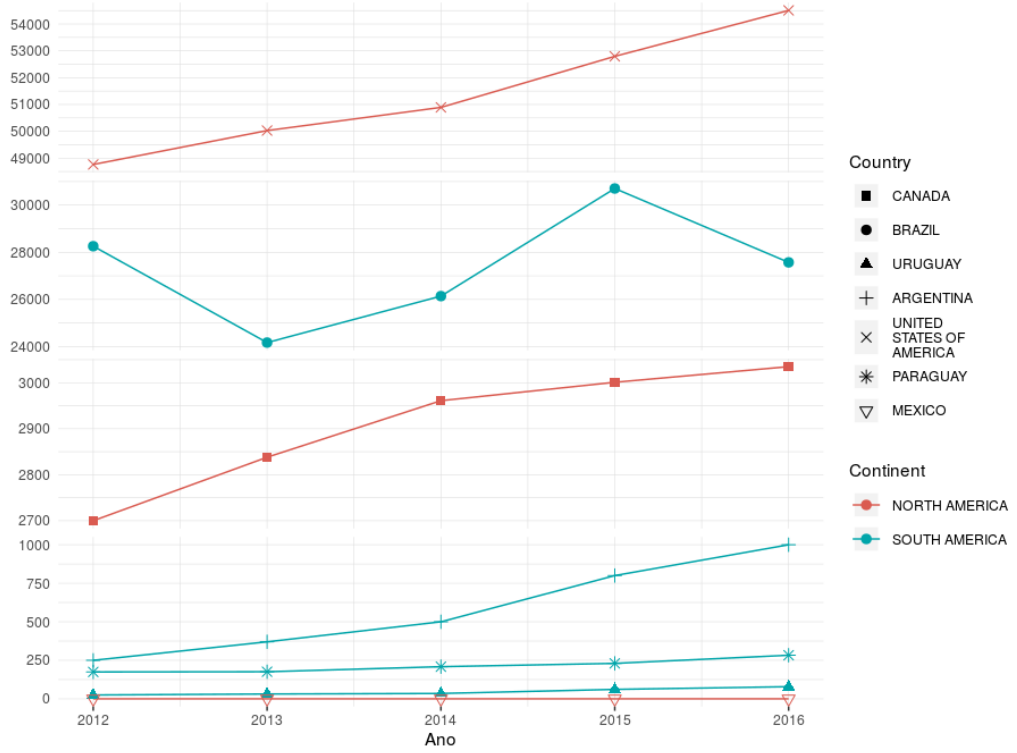
If so, summarize and provide reference (name of the law, regulation, strategy/date of coming into force/URL).

(Open question)

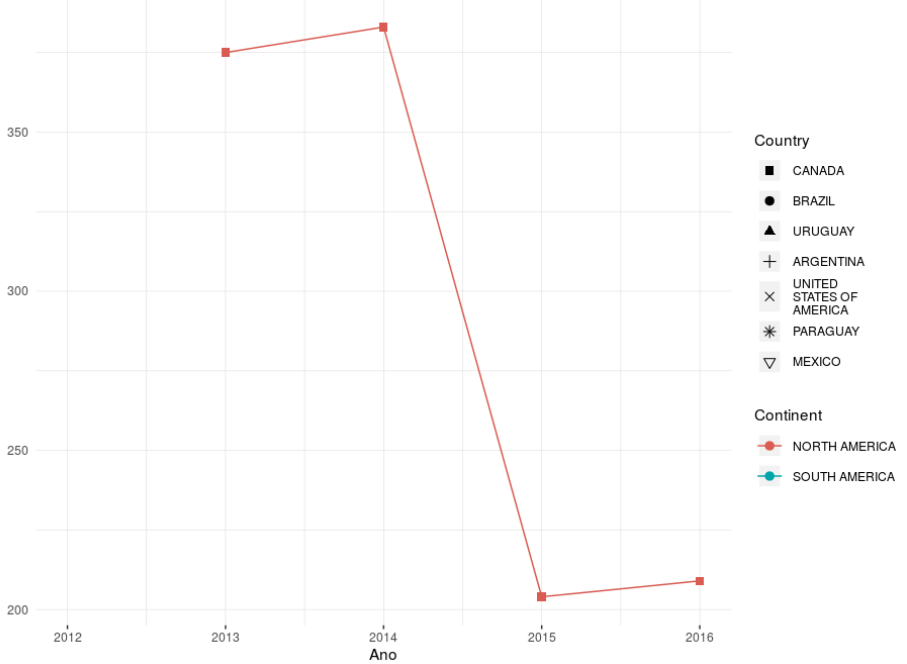
12. What are the figures for biofuels consumption in your country for each year below? (in million litres)



Question 12 - Sugar Based Ethanol



Question 12 - Hydrogenated vegetable oil (HVO)



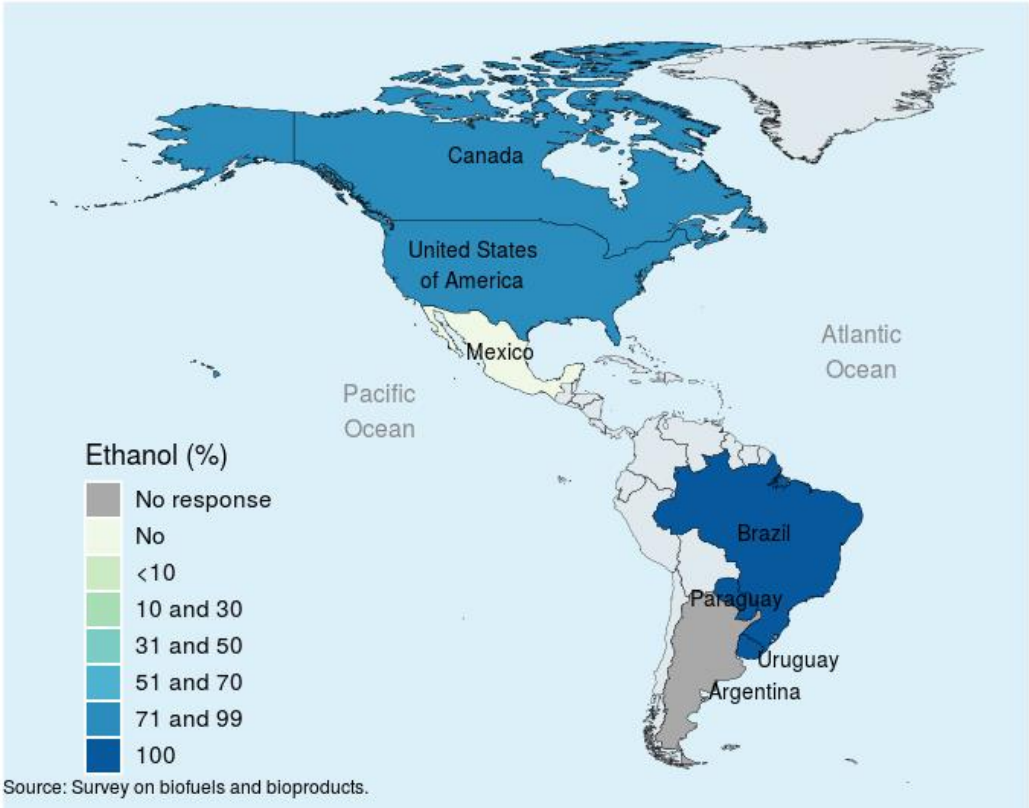
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Specify others and provide reference.

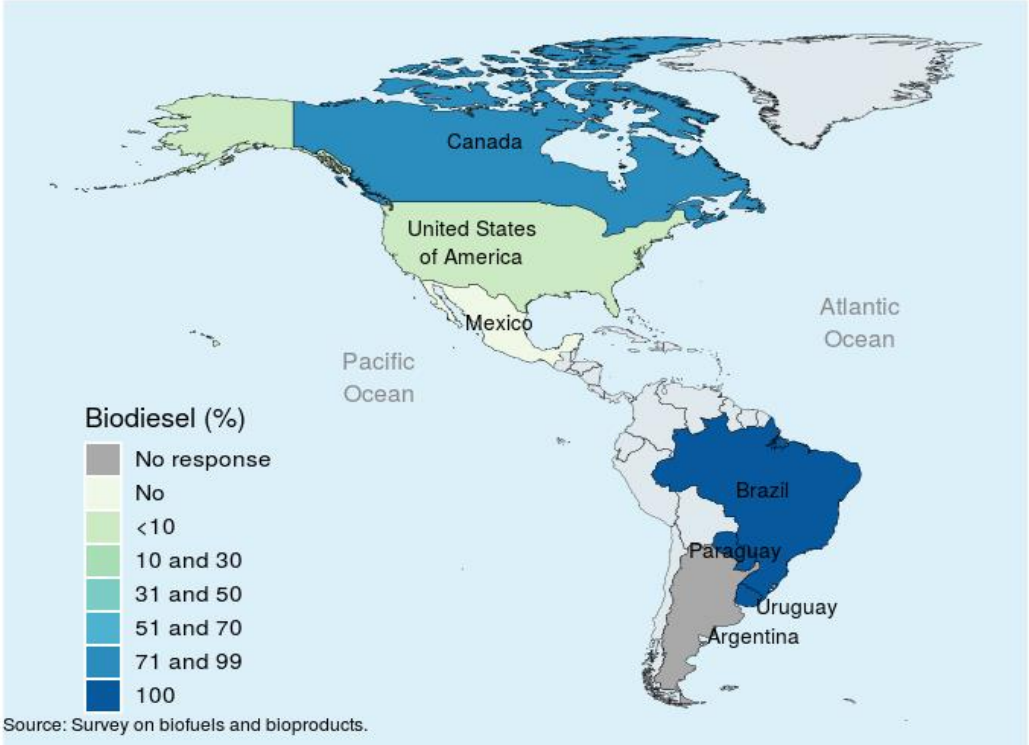
(Open question)

13. What is the share (%) of gas stations that sell biofuels in your country?

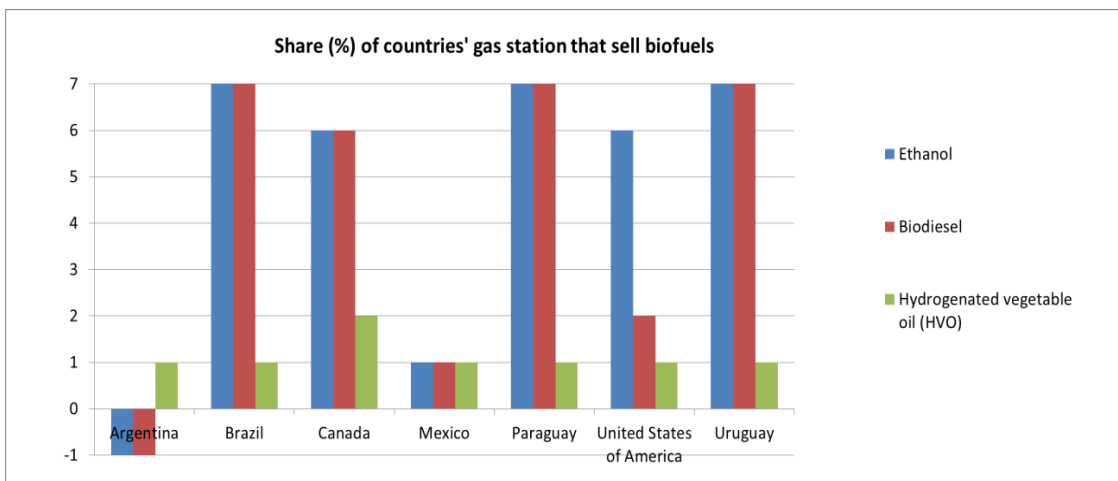
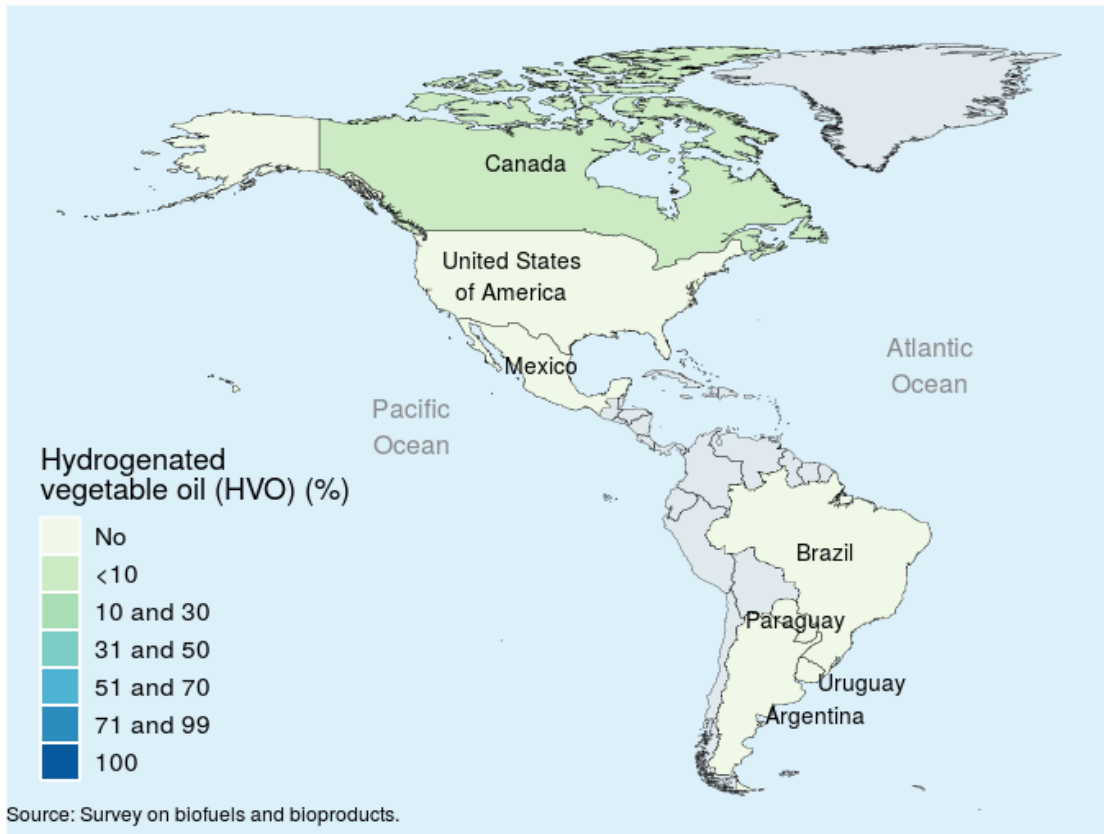
Question 13 - Ethanol



Question 13 - Biodiesel



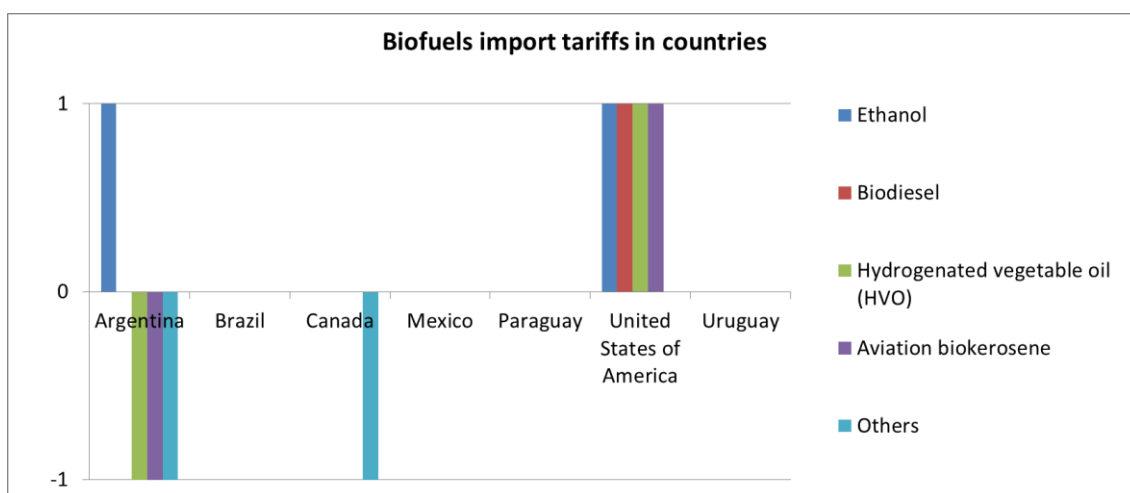
### Question 13 - Hydrogenated vegetable oil (HVO)



1-there isn't; 2 - <5%; 3 - 5% to 10%; 4 - 11% to 30%; 5 - 31% to 50%; 6 -> 50%; negative - did not respond

14. Are there import tariffs which apply to biofuels in your country?

Country	Ethanol		Biodiesel		Hydrogenated vegetable oil		Aviation biokerosene		Others	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
ARGENTINA		X	X							
BRAZIL	X		X		X		X			X
CANADA	X		X		X		X			X
MEXICO	X		X		X		X			X
PARAGUAY	X		X		X		X			X
UNITED STATES OF AMERICA		X		X		X		X		X
URUGUAY	X		X		X		X			X
<b>Total</b>	<b>5</b>	<b>2</b>	<b>6</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>5</b>	<b>5</b>



0- No; 1- Yes, -1 did not respond

If so, summarize and provide reference (name of the law, regulation, strategy/date of coming into force/URL)

(Open question)

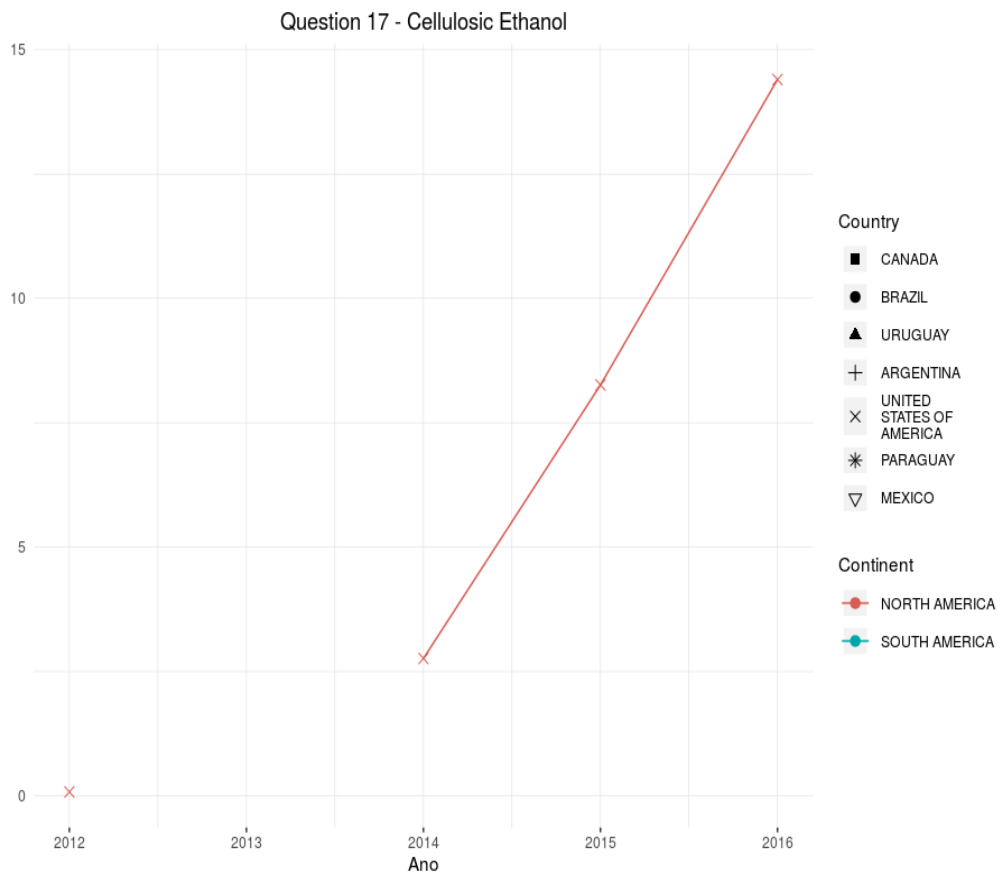
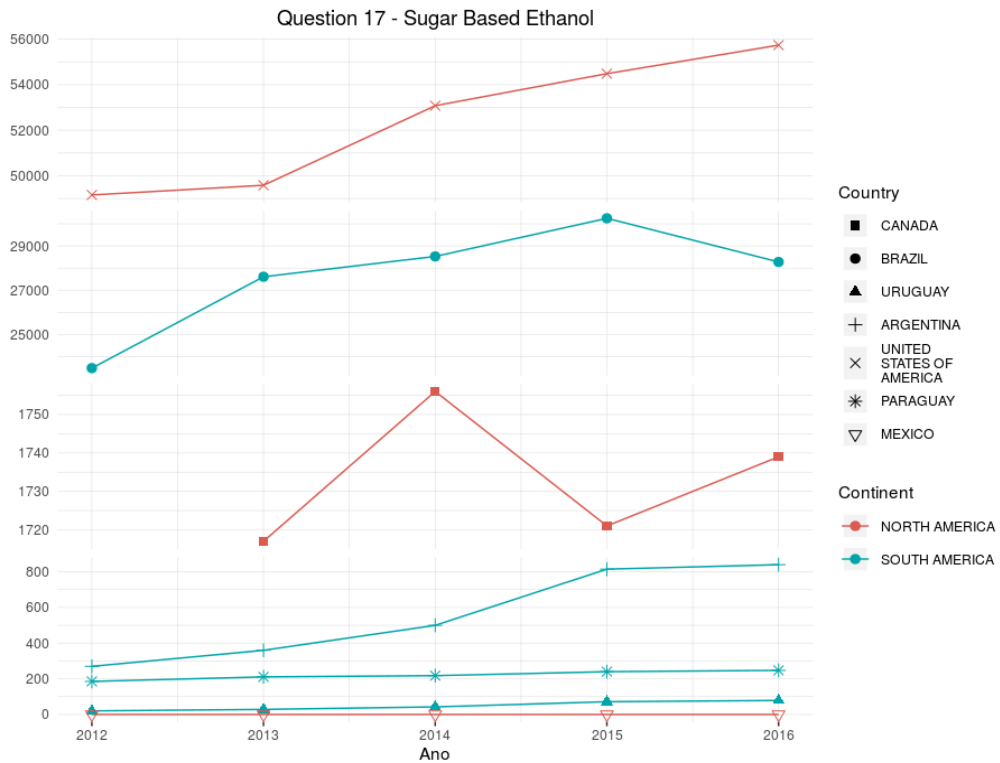
15 and 16. Does your country publish statistics on the production of bioproducts and biofuels?

Country	Bioproducts		Biofuels	
	NO	YES	NO	YES
ARGENTINA	X			X
BRAZIL	X			X
CANADA		X		X
MEXICO	X		X	
PARAGUAY	X			X
UNITED STATES OF AMERICA	X			X
URUGUAY	X			X
<b>Total</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>6</b>

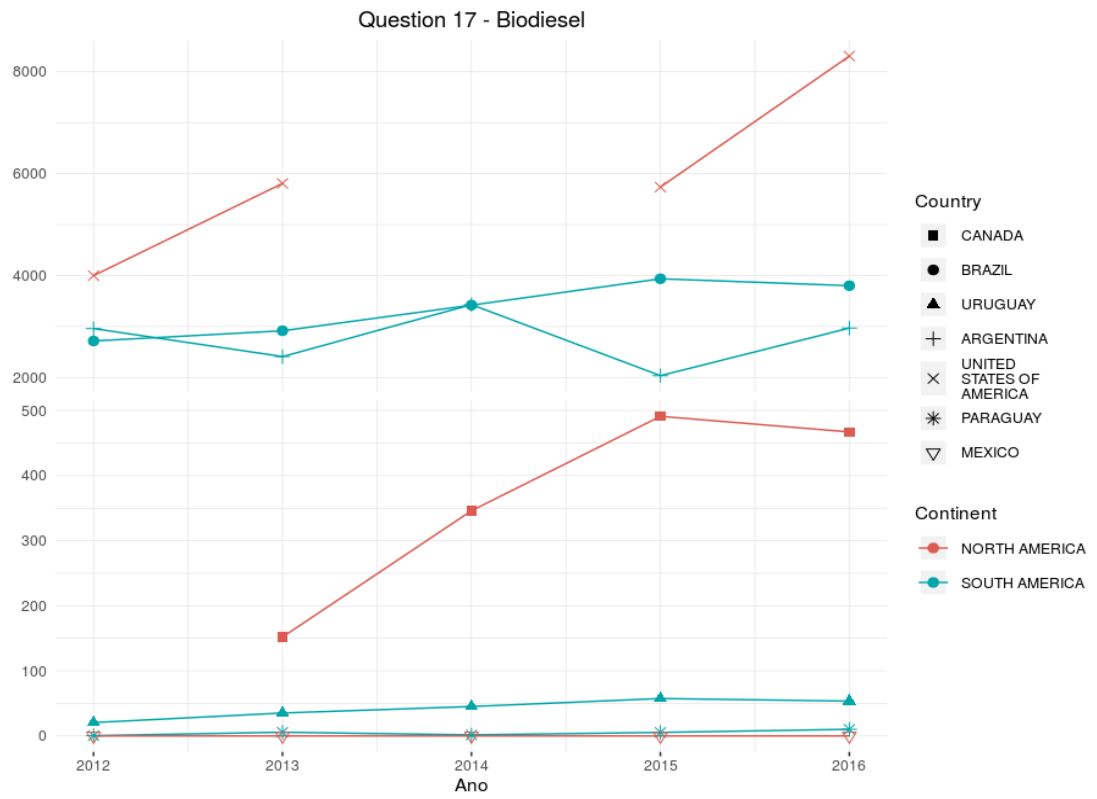
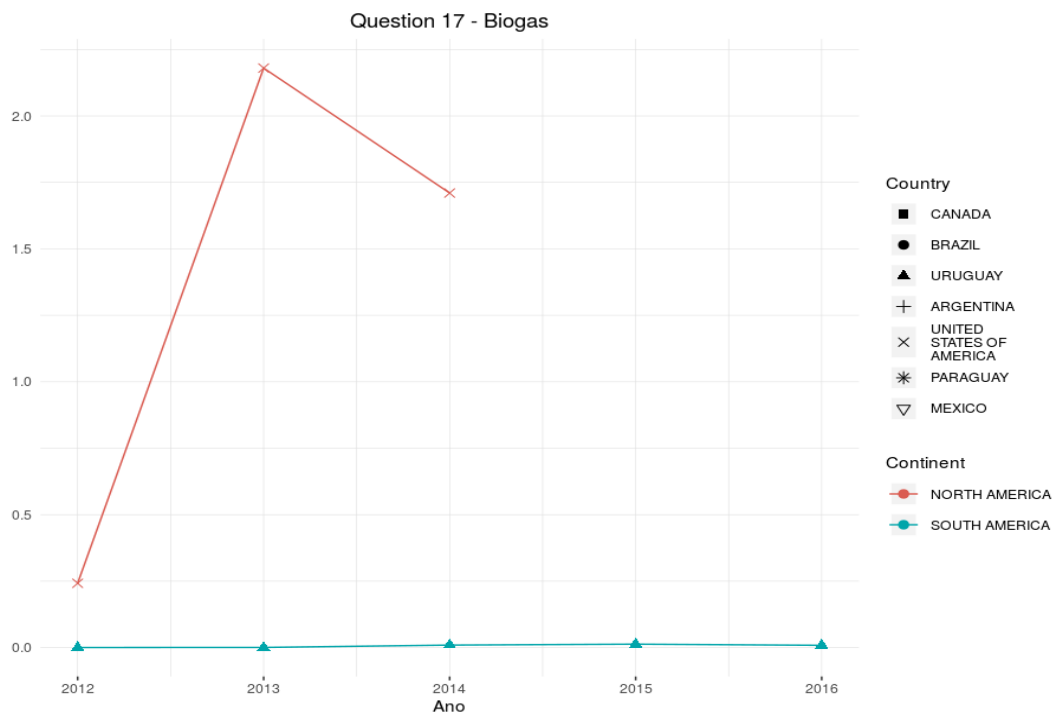
Provide a reference and/or relevant website link.

(Open question)

17. What are the figures for biofuels production in your country for each year below? (in million liters, except for biogas in Petajoules)







Specify others and provide reference.

(Open question)

18. What are the main feedstocks used to produce biofuels in your country?

Country	Ethanol				Cellulosic ethanol			Biodiesel				Aviation biokerosene			Biogas			
	Sugarcane	Corn	Wheat	Other	Agriculture residues	Forest residues	Other	Soybean	Animal fats	Rapeseed	Other	Starch and sugar crops	Oil crops/ animal fats	Lignocellulosic crops	Manure	Municipal waste	Agriculture residues	Other
ARGENTINA	X	X						X								X	X	
BRAZIL	X			X	X		X	X	X			X		X	X	X		
CANADA		X	X		X	X				X	X				X	X		
MEXICO	X			X	X				X		X				X	X		
PARAGUAY	X	X						X										
UNITED STATES OF AMERICA		X			X			X					X					X
URUGUAY	X			X				X	X						X	X		

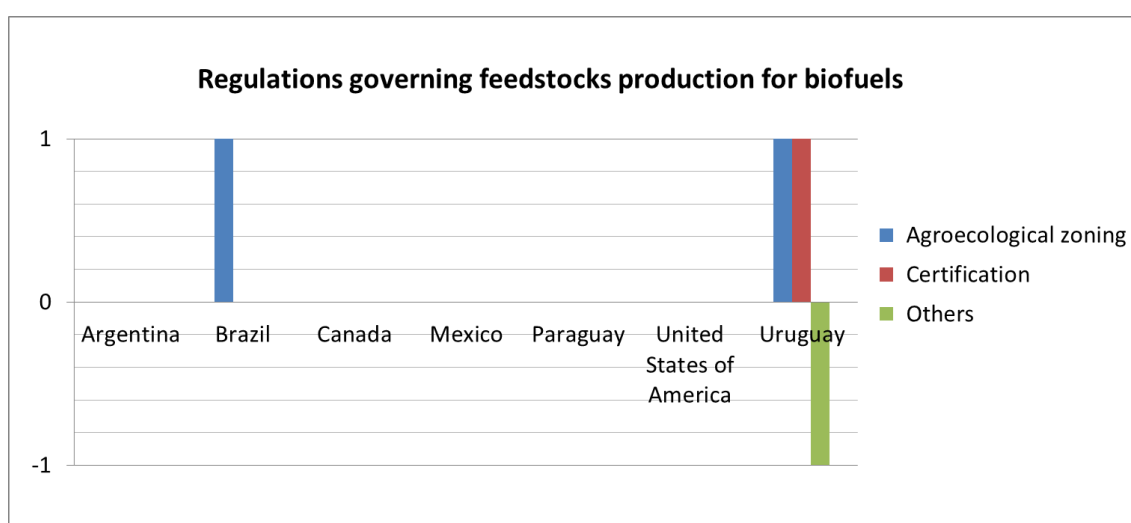
Others (specify if possible)  
(Open question)

19. What are the areas of the most significant crops used for biofuels production? (thousand hectares)

Country	SOYBEAN					SUGARCANE					CORN					CANOLA					WHEAT				
	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
ARGENTINA	19.000	20.000	20.000	20.000	20.000	360	380	365	385	385	3.600	3.500	3.700	3.500	4.600										
BRAZIL	25.042	27.736	30.173	32.093	33.177	8.495	8.811	9.005	8.654	9.049															
CANADA	1.680	2.000	2.250	2.190	2.210						1.418	1.480	1.227	1.310	1.390	7.471	8.050	8.344	8.083	7.824	9.497	10.440	9.480	9.600	9.547
MEXICO																									
PARAGUAY																									
UNITED STA	31.200	31.100	33.700	33.400	33.800						39.372	38.593	36.663	36.612	38.042										
URUGUAY	1.100	1.300	1.400	1.400	1.100	7	7	8	8	8						35	30	30	30	50					

20. Does your country have regulations governing the feedstocks production for biofuels?

Country	Agroecological zoning		Certification		Others	
	NO	YES	NO	YES	NO	YES
ARGENTINA	X		X		X	
BRAZIL		X	X		X	
CANADA	X		X		X	
MEXICO	X		X		X	
PARAGUAY	X		X		X	
UNITED STATES OF AMERICA	X		X		X	
URUGUAY		X		X		
<b>Total</b>	<b>5</b>	<b>2</b>	<b>6</b>	<b>1</b>	<b>6</b>	<b>0</b>



0- No; 1- Yes, -1 did not respond

If so, summarize and give references (name of the law, regulation, strategy/date of coming into force/URL)

(Open question)

21. What are the lowest estimated current production costs for biofuels (pilot, demonstration or commercial scale)? (U\$/L)

(Open question)

22. What are the estimated production costs for biofuels by 2030? (U\$/L)

Country	Starch and sugar-based		Cellulosic ethanol		Biodiesel		Hydrogenated vegetable		Aviation biokerosene	
	Present	2030	Present	2030	Present	2030	Present	2030	Present	2030
ARGENTINA	0,63				0,61					
BRAZIL	0.42		0.65	0.23	0.70	0.62	1.3		0.42	0.32
CANADA										
MEXICO					0.72					
PARAGUAY	1,00									
UNITED STATES OF AMERICA		0,78		0,56						0.991
URUGUAY										

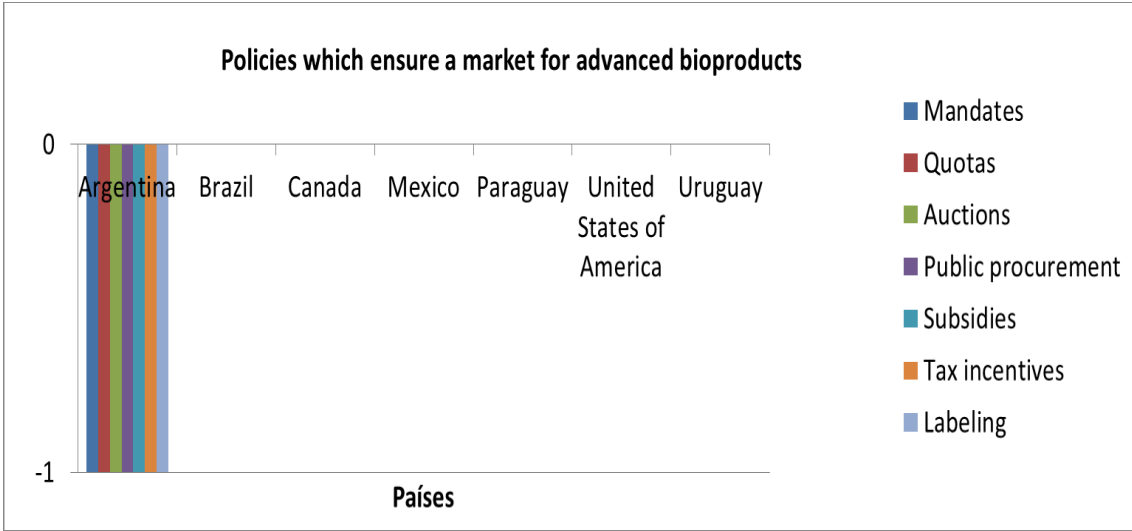
Other (specify if possible)

(Open question)

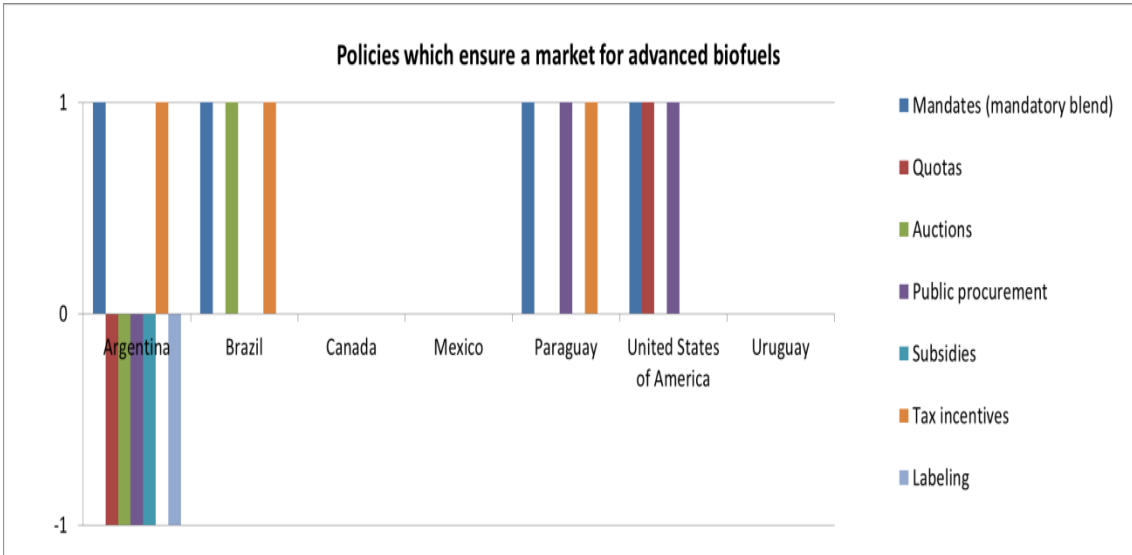
23. Are there specific policies which ensure a market for advanced biofuels and bioproducts in your country?

Biofuels																
Country	Mandates		Quotas		Auctions		Public		Subsidy		Tax incentives		Labeling		Others	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
ARGENTINA		X										X				
BRAZIL		X	X			X		X		X		X		X		X
CANADA	X		X		X		X		X		X		X			
MEXICO	X		X		X		X		X		X		X			X
PARAGUAY		X	X		X			X		X		X		X		X
UNITED STATES OF AMERICA		X		X	X			X		X		X		X		X
URUGUAY	X		X		X		X		X		X		X		X	
<b>TOTAL</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>4</b>	<b>2</b>	<b>6</b>	<b>0</b>	<b>4</b>	<b>3</b>	<b>6</b>	<b>0</b>	<b>5</b>	<b>0</b>

Bioproducts																
Country	Mandates		Quotas		Auctions		Public		Subsidy		Tax incentives		Labeling		Others	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
ARGENTINA																
BRAZIL	X		X		X		X		X		X		X		X	
CANADA	X		X		X		X		X		X		X			
MEXICO	X		X		X		X		X		X		X			X
PARAGUAY	X		X		X		X		X		X		X		X	
UNITED STATES OF AMERICA	X		X		X		X		X		X		X		X	
URUGUAY	X		X		X		X		X		X		X		X	
<b>TOTAL</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>5</b>	<b>0</b>



0- No; 1- Yes, -1 did not respond



0- No; 1- Yes, -1 did not respond

If so, summarize and provide references (name of the law, regulation, strategy/date of coming into force/URL)

(Open question)

24. Are there support mechanisms to encourage investment in advanced biofuels and bioproducts production facilities in your country?

Biofuels												
Country	Investment grants		Preferential		Loan guarantees		Venture funds		Tax incentives		Others	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
ARGENTINA	X			X		X	X			X		
BRAZIL		X		X		X		X		X	X	
CANADA		X	X		X			X		X		X
MEXICO	X		X		X		X		X		X	
PARAGUAY		X		X		X		X		X		
UNITED STATES OF AMERICA		X	X			X	X		X			X
URUGUAY	X		X		X		X			X		
<b>TOTAL</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>5</b>	<b>2</b>	<b>2</b>

Bioproducts												
Country	Investment grants		Preferential		Loan guarantees		Venture funds		Tax incentives		Others	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
ARGENTINA												
BRAZIL	X		X		X		X		X		X	
CANADA		X	X		X		X		X		X	
MEXICO	X		X		X		X		X		X	
PARAGUAY		X		X		X		X		X	X	
UNITED STATES OF AMERICA		X	X		X		X		X			X
URUGUAY	X		X		X		X			X		
<b>TOTAL</b>	<b>3</b>	<b>3</b>	<b>5</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>4</b>	<b>2</b>	<b>4</b>	<b>1</b>

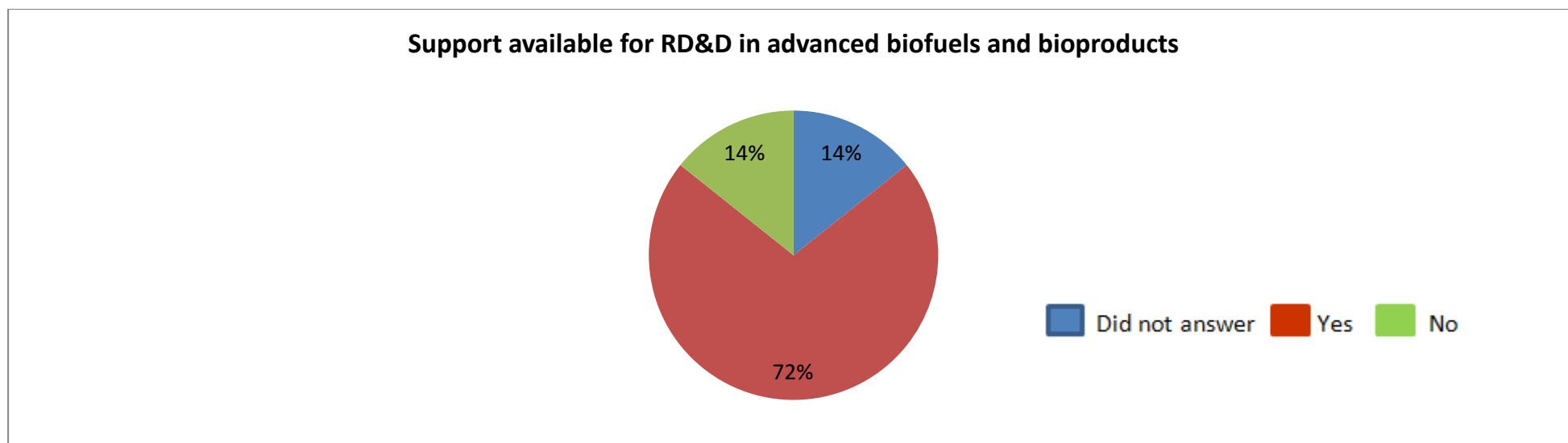
If so, summarize and provide references (name of the law, regulation, strategy/date of coming into force/URL),

(Open question)

25. Is there support available for R,D and D in advanced biofuels and/or bioproducts?

(Inconsistent data)

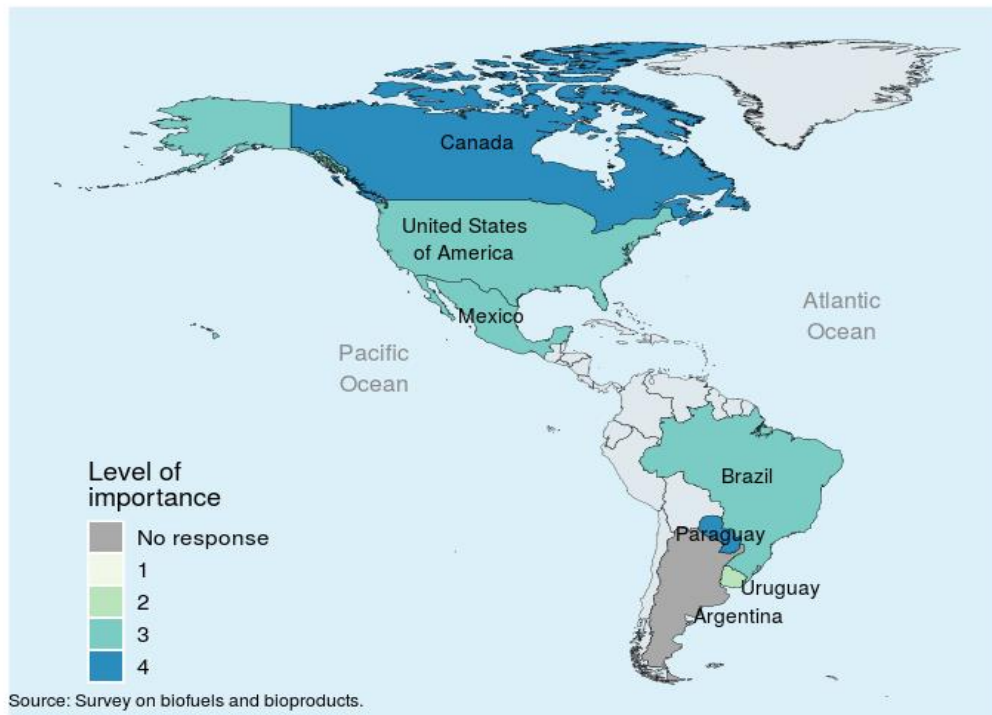
Country	Yes or No	Grants					Subsidies					Plants					Private					Others				
		2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
ARGENTINA																										
BRAZIL	YES																									
CANADA	YES																									
MEXICO	YES																									
PARAGUAY	NO																									
UNITED STATES OF AMERICA	YES																									
URUGUAY	YES																									



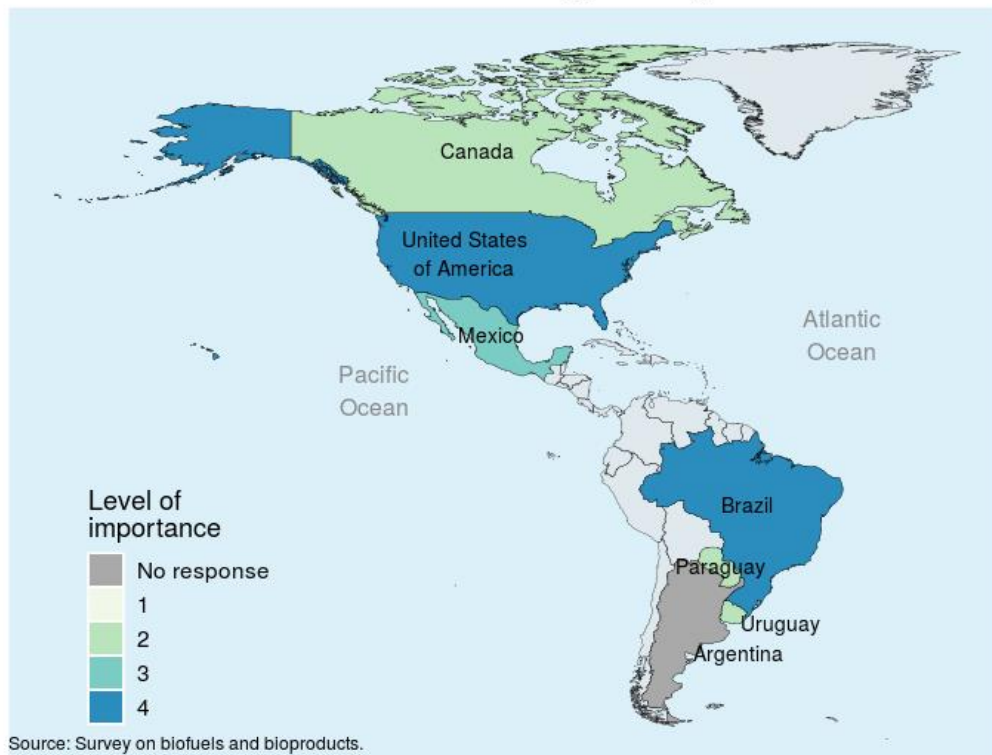


26. What are the main drivers for advanced biofuels development and deployment? (1irrelevant; 4very important)

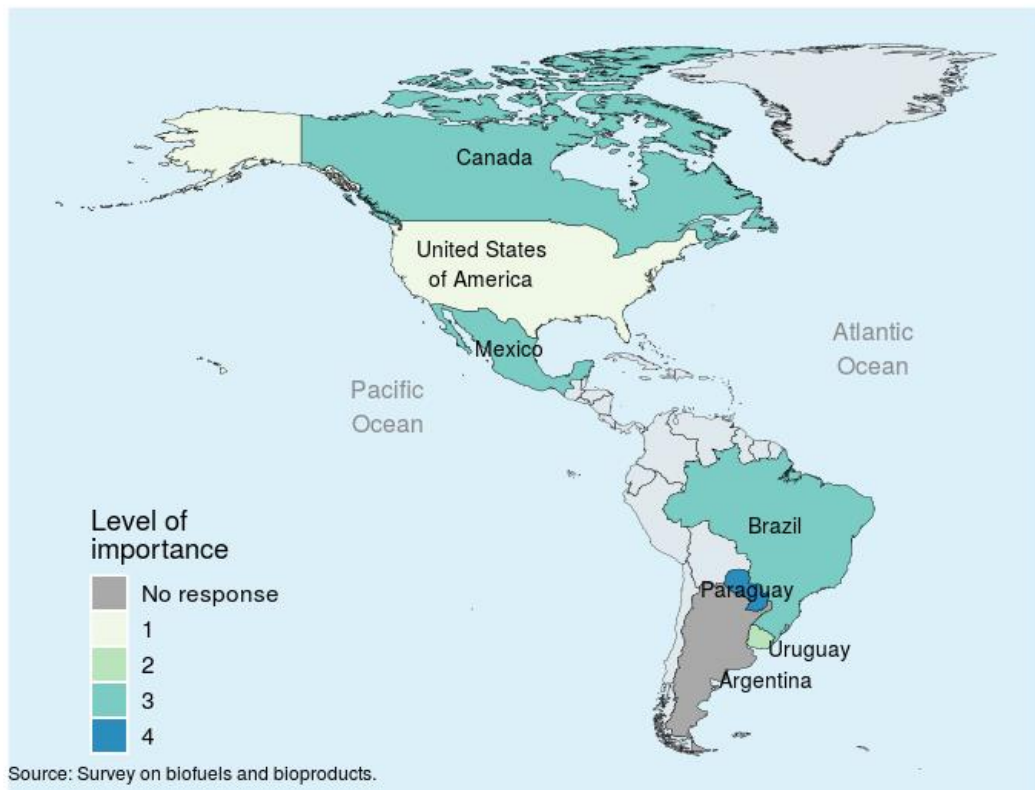
Question 26 - GHG emissions reduction



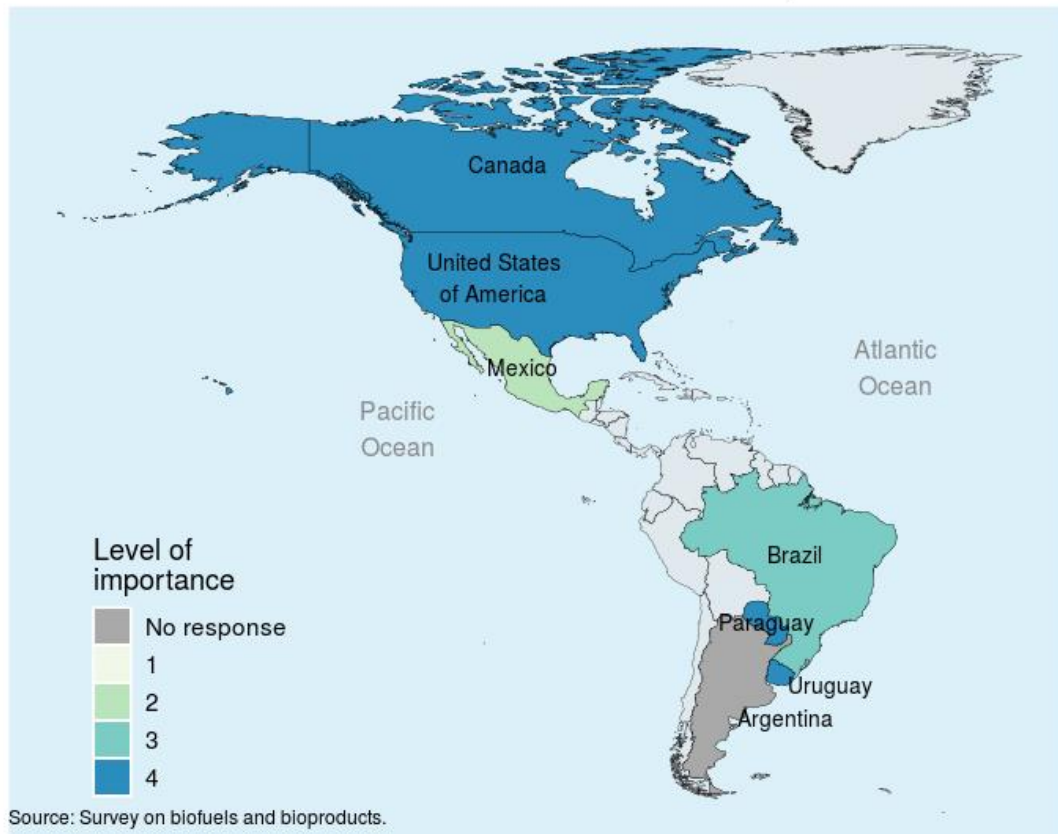
Question 26 - Energy security



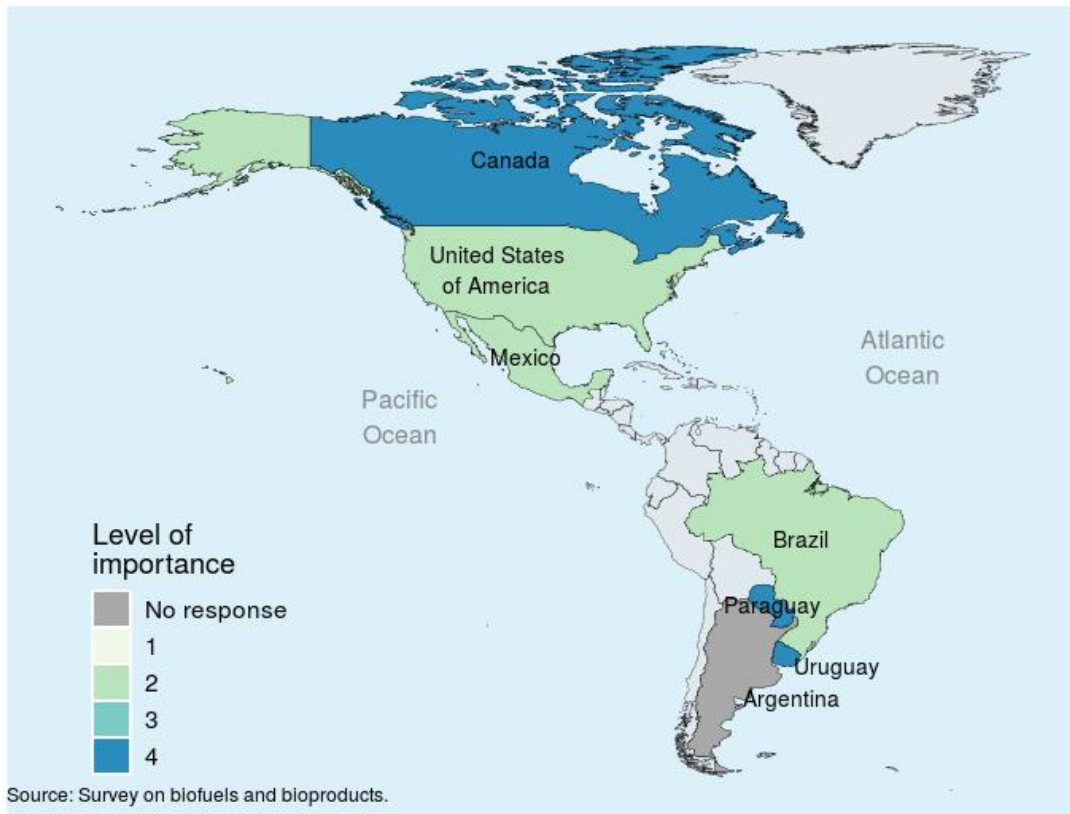
### Question 26 - Exit from fossils



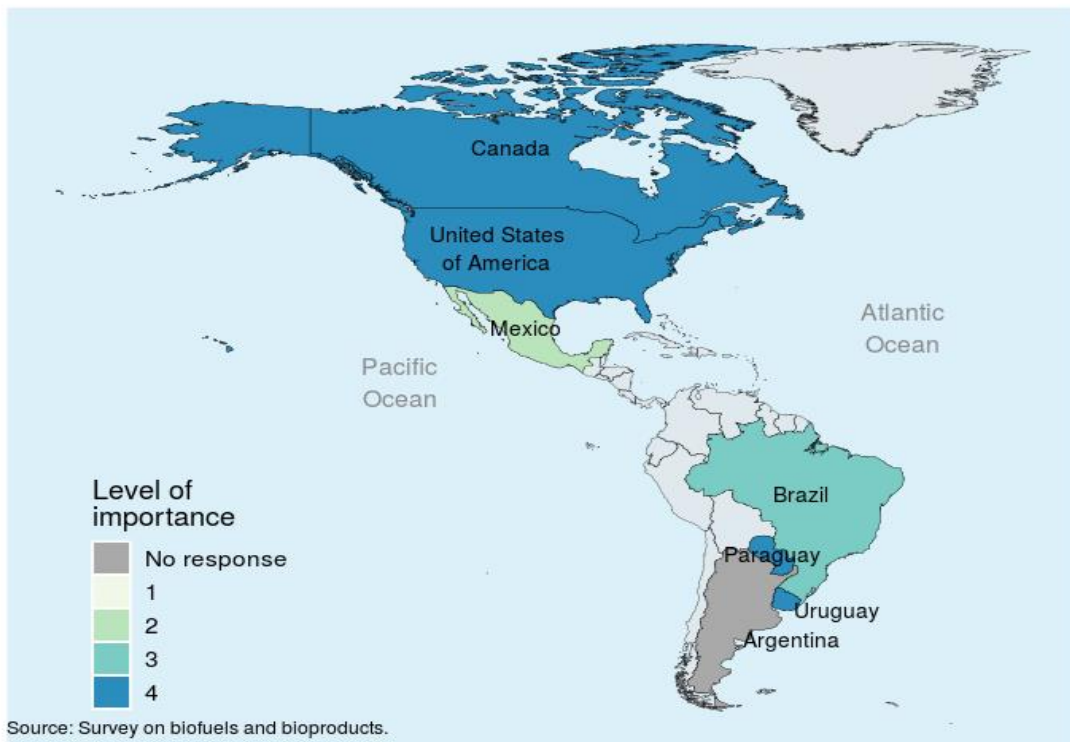
### Question 26 - Domestic bioindustry



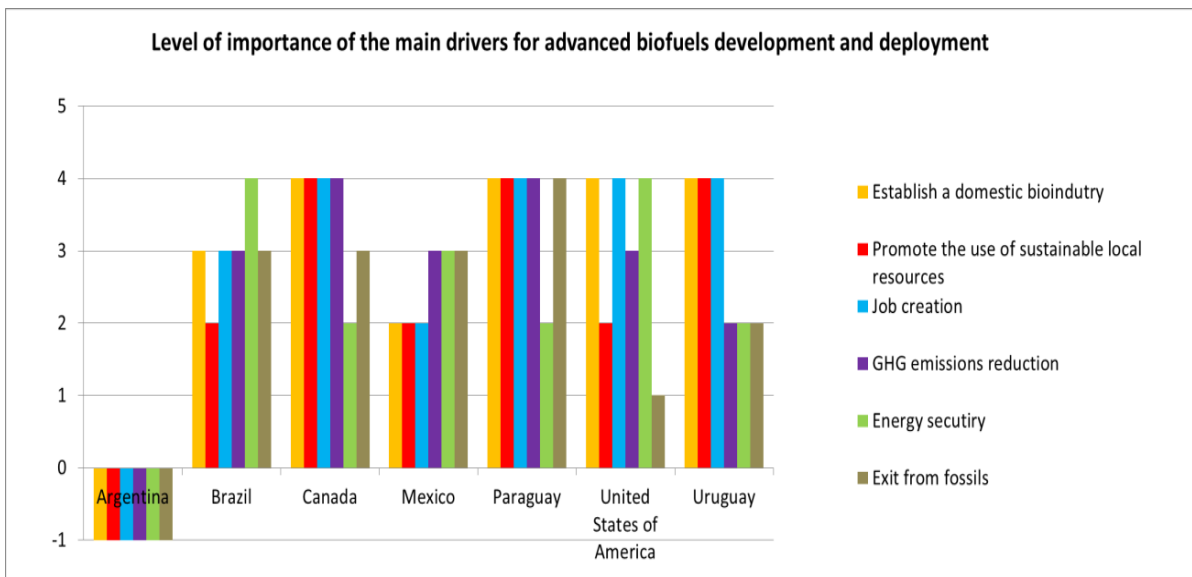
### Question 26 - Local resources



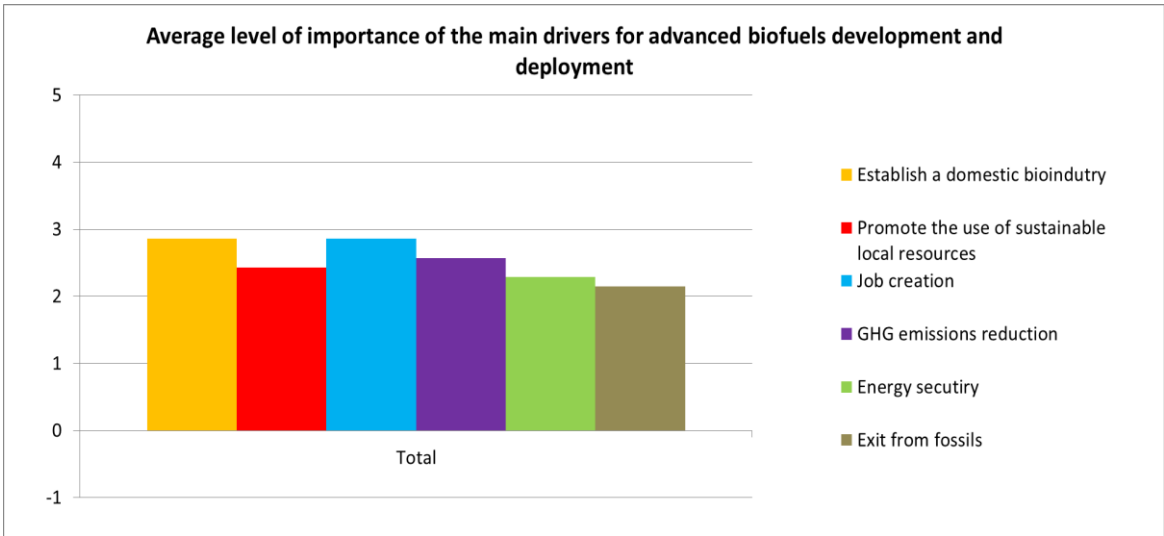
### Question 26 - Job creation



### Question 26 - Others



1-there isn't; 2 - <5%; 3 - 5% to 10%; 4 - 11% to 30%; 5 - 31% to 50%; 6 - > 50%; negative - did not respond.



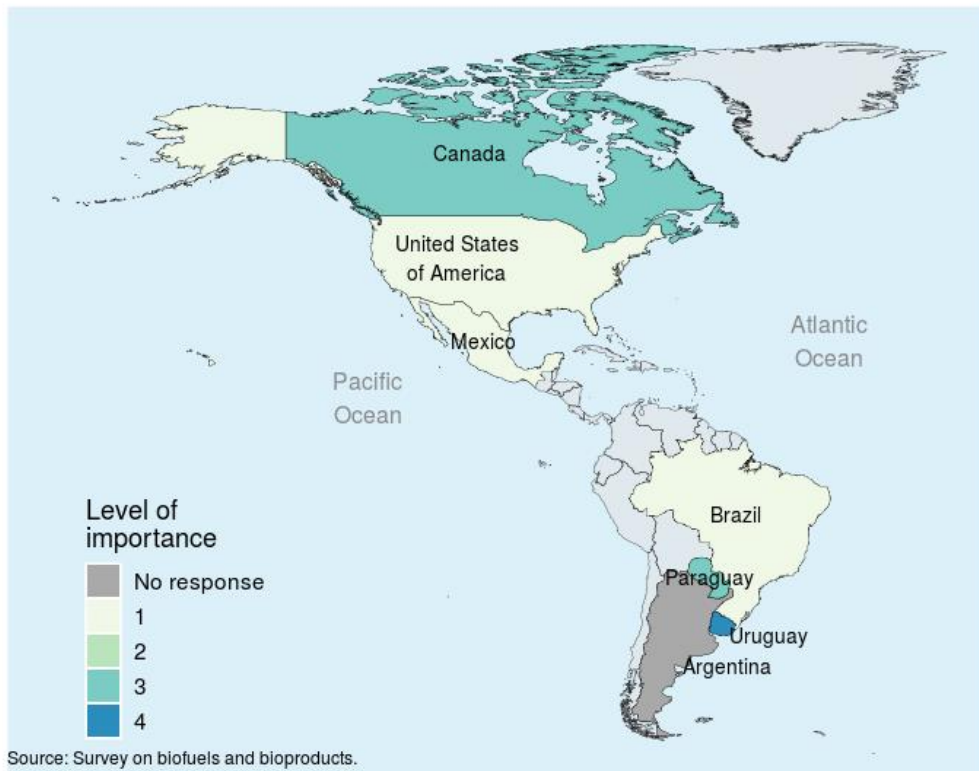
0- No; 1- Yes, -1 did not respond

If others, specify.

(Open question)

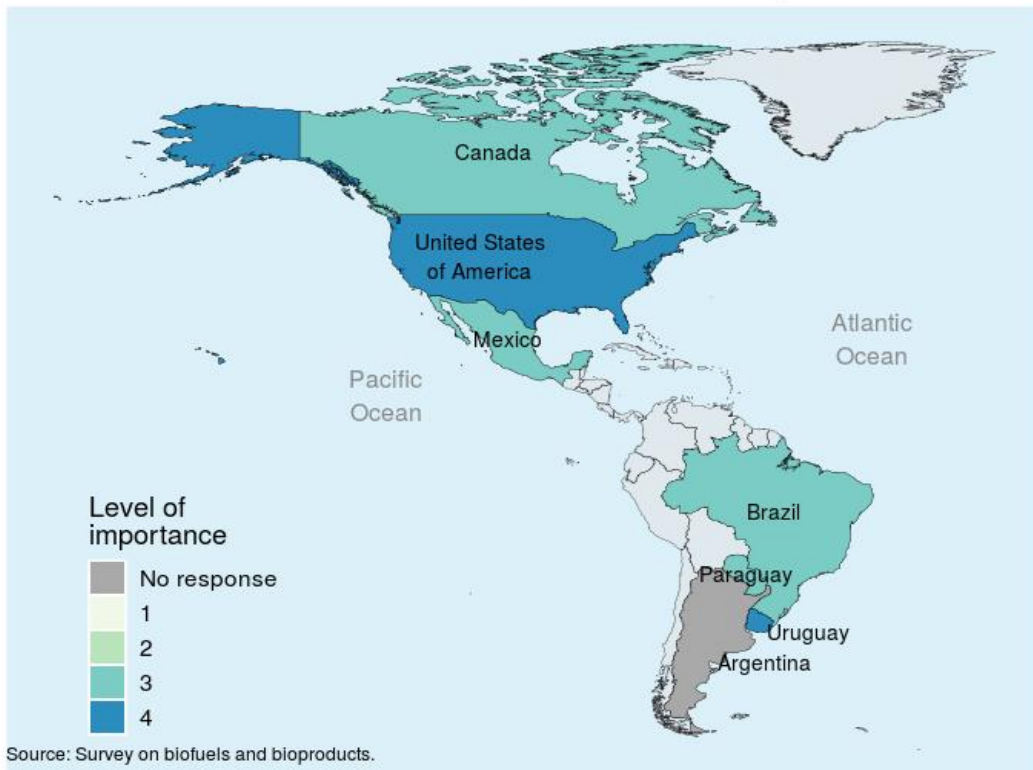
27. Which drivers are identified to foster bioproducts development in your country? (1irrelevant; 4very important)

Question 27 - GHG emissions reduction

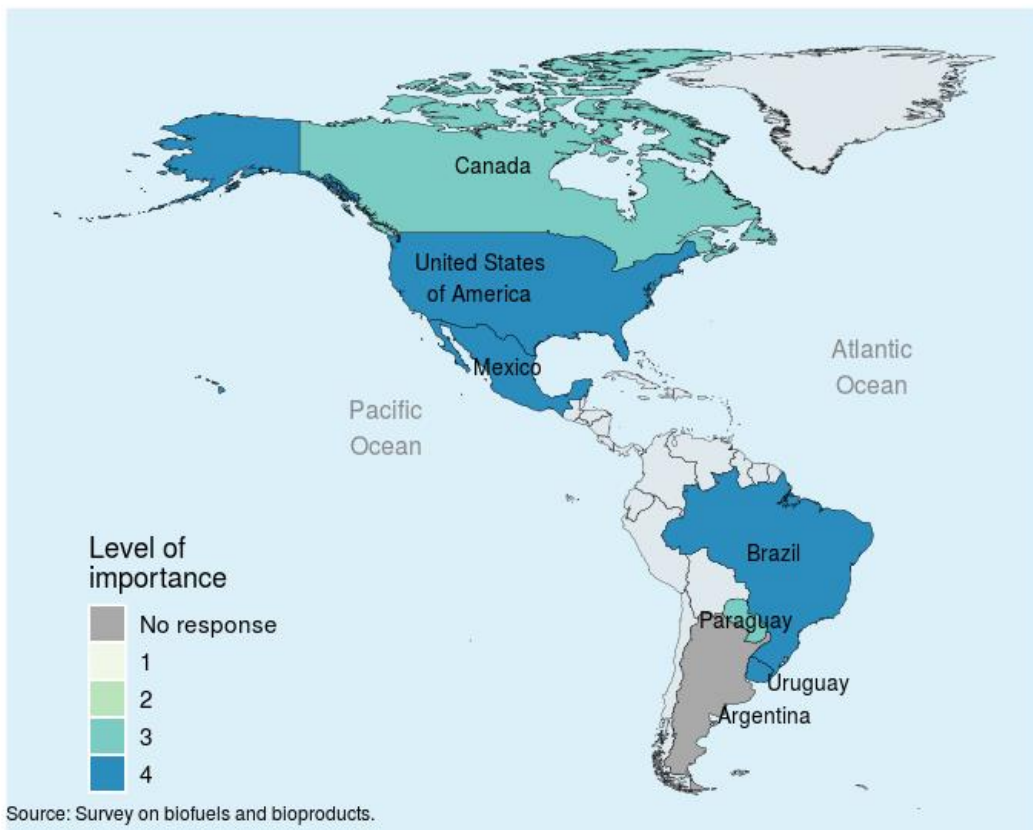


Source: Survey on biofuels and bioproducts.

### Question 27 - New biobased industry



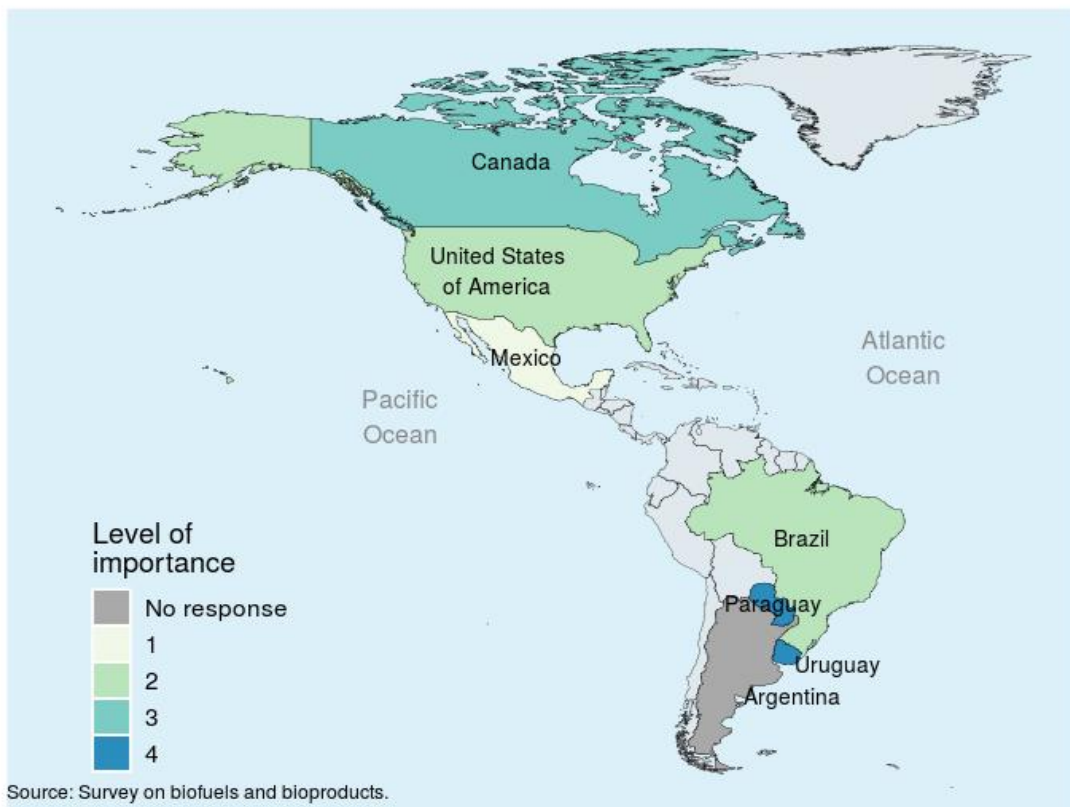
### Question 27 - Association with biofuels



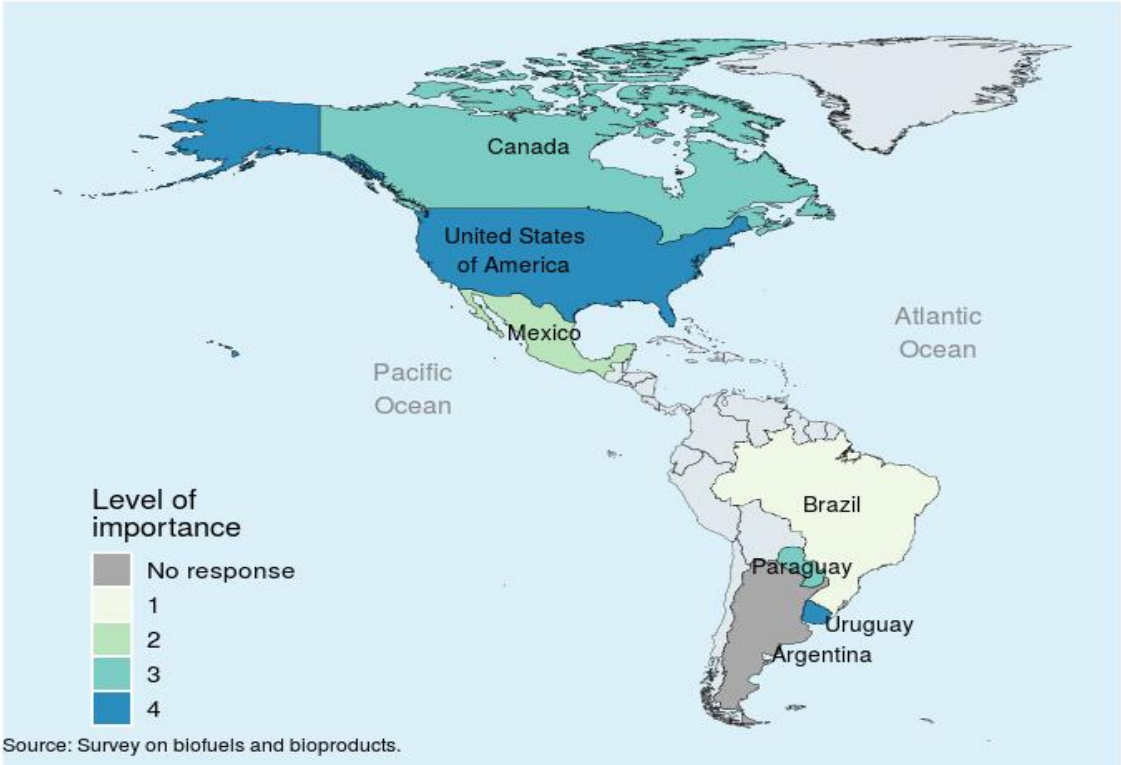
### Question 27 - Trade balance



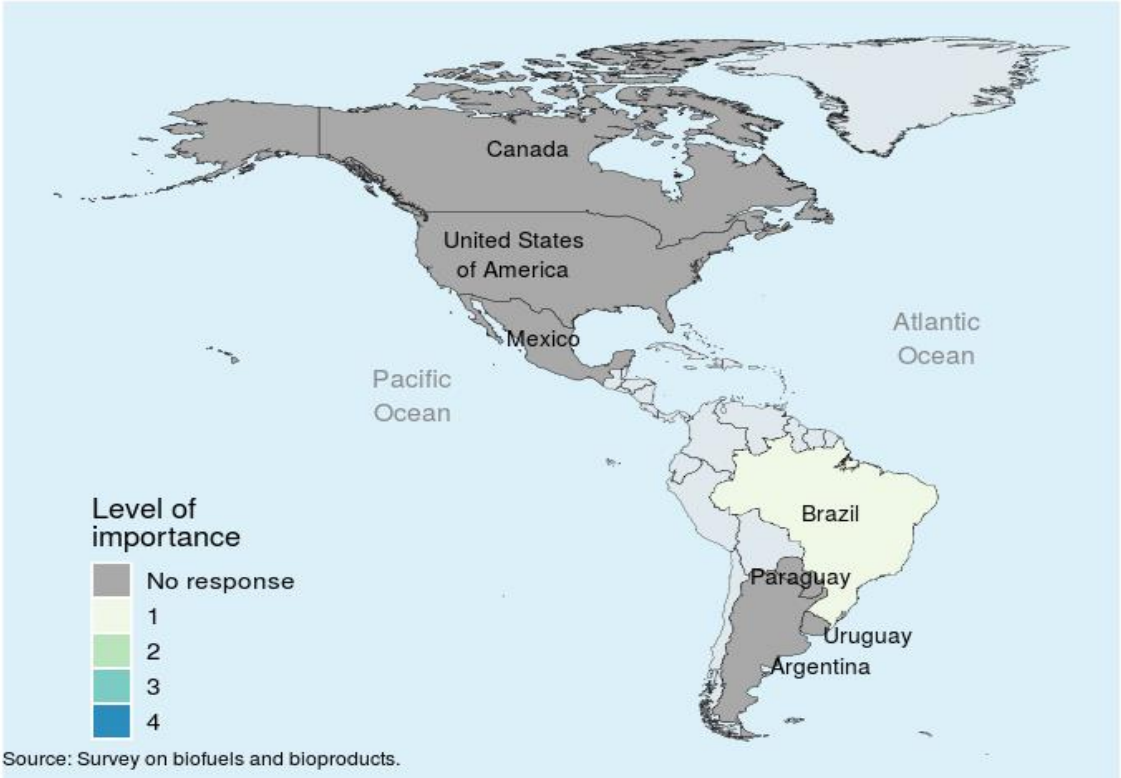
### Question 27 - Biomass valorization



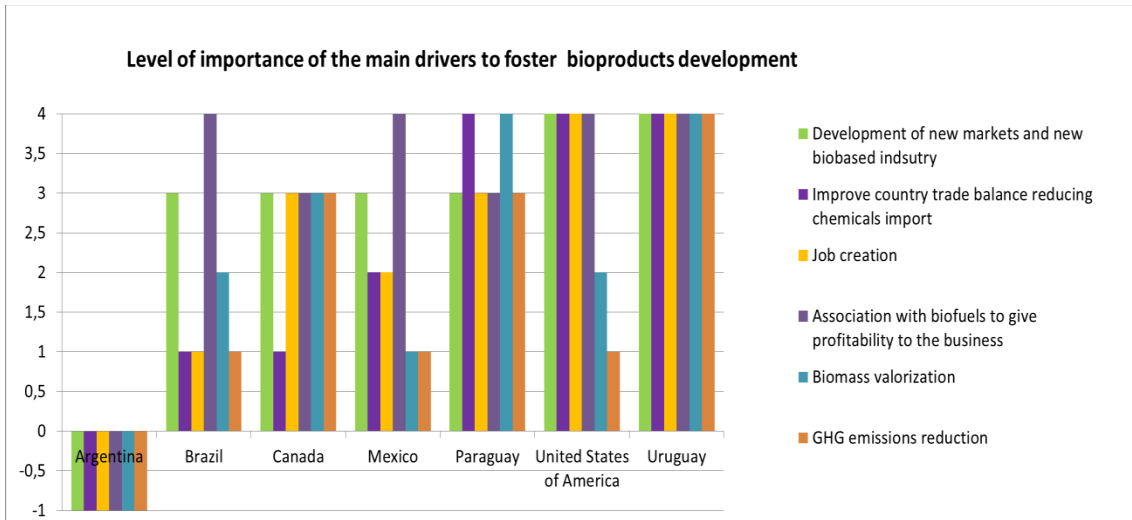
Question 27 - Job creation



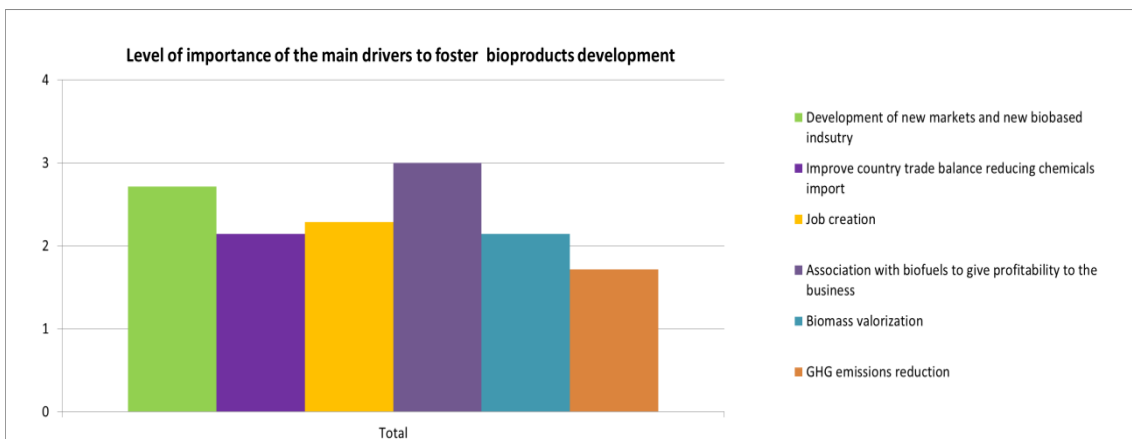
Question 27 - Others







Level of importance: -1 did not respond; 1 - irrelevant; 2 - relevant; 3 - important; 4 - very importante.



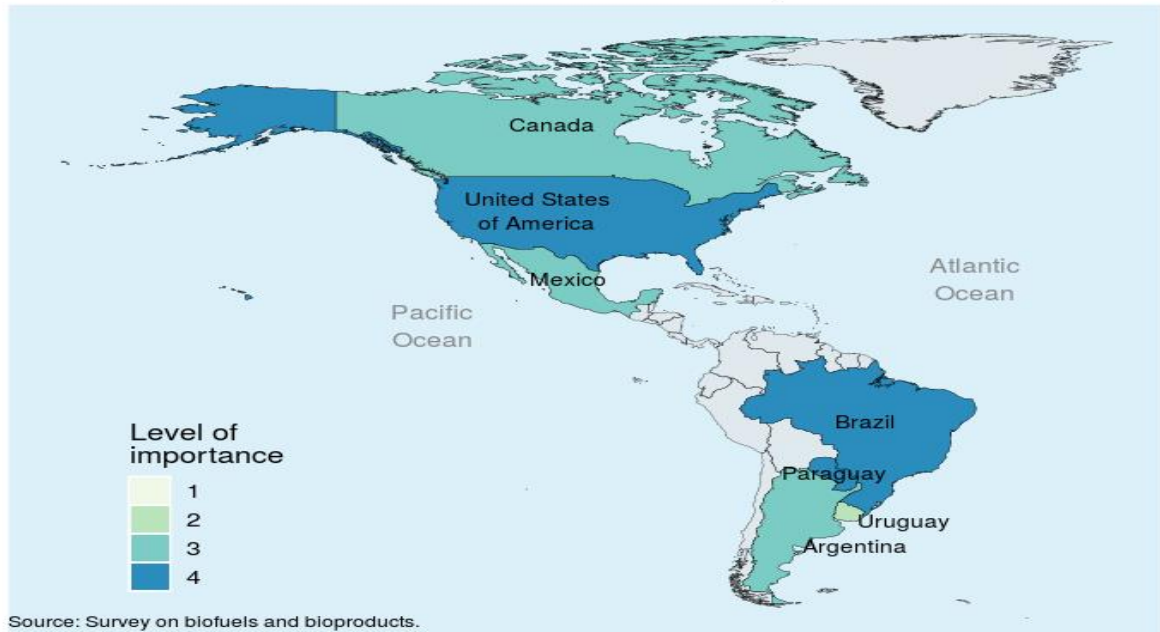
Level of importance: 1 - irrelevant; 2 - relevant; 3 - important; 4 - very importante.

If others, specify.

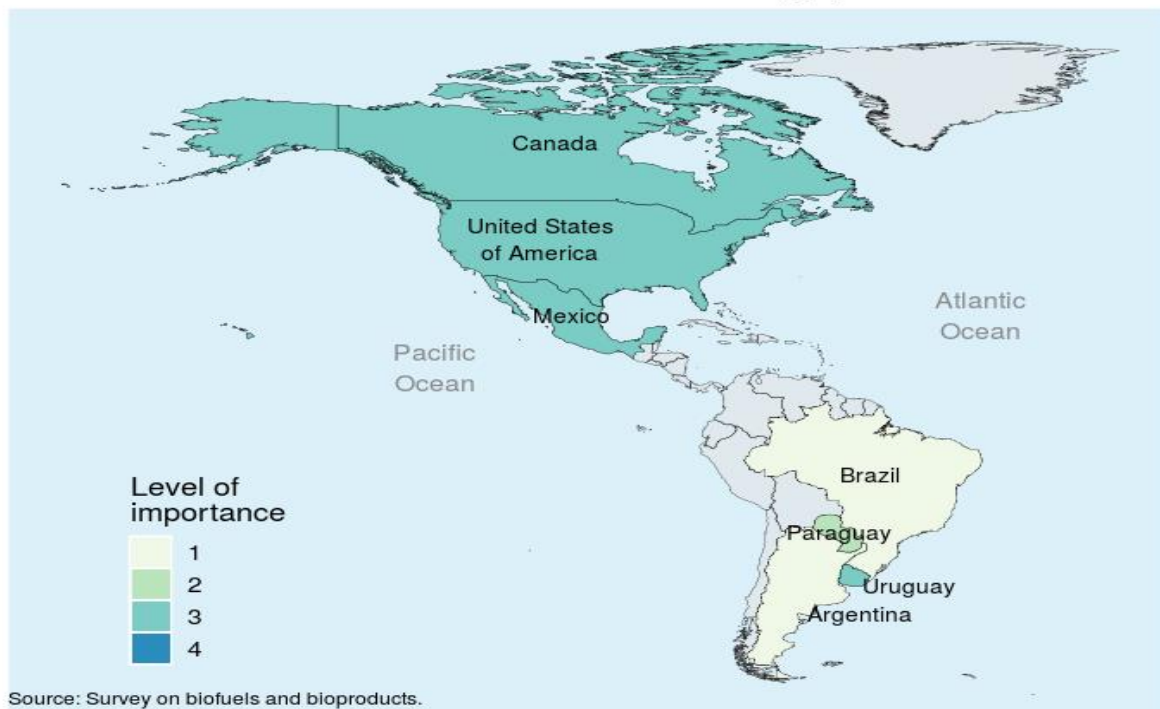
(Open question)

28. What are the main challenges to further development and deployment of advanced biofuels in your country?  
(1irrelevant; 4very important)

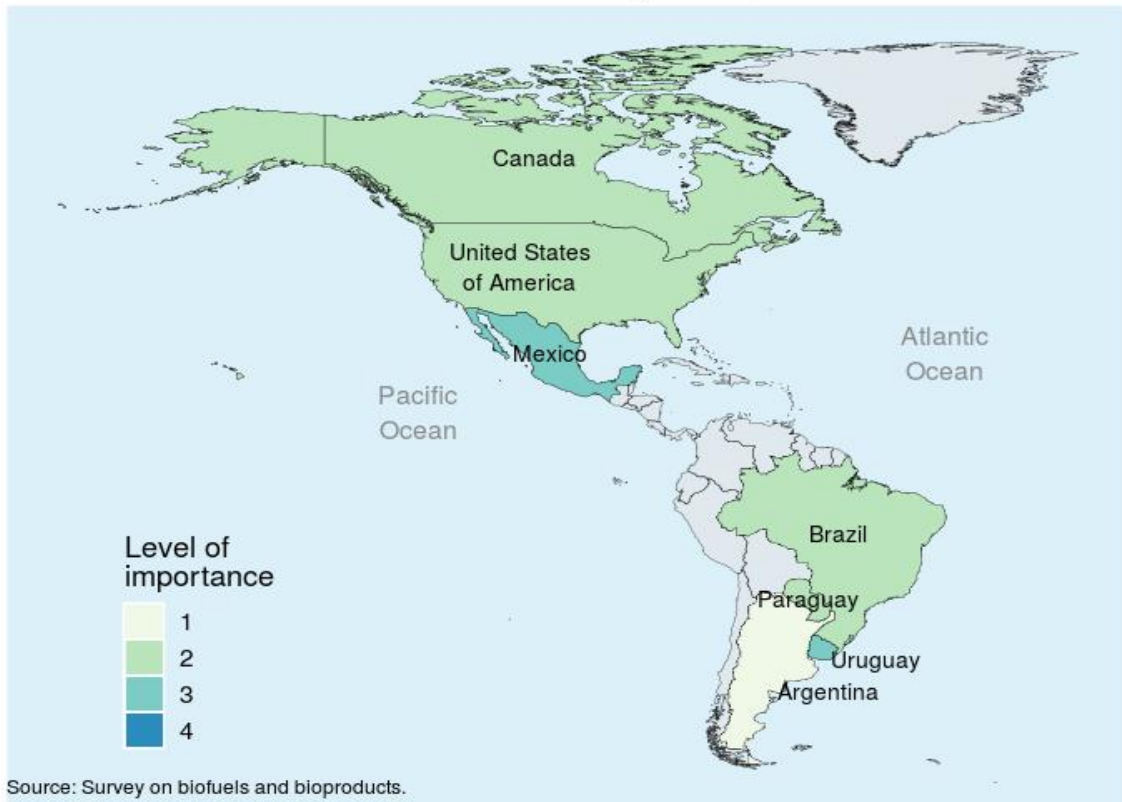
Question 28 - Fossil fuels competition



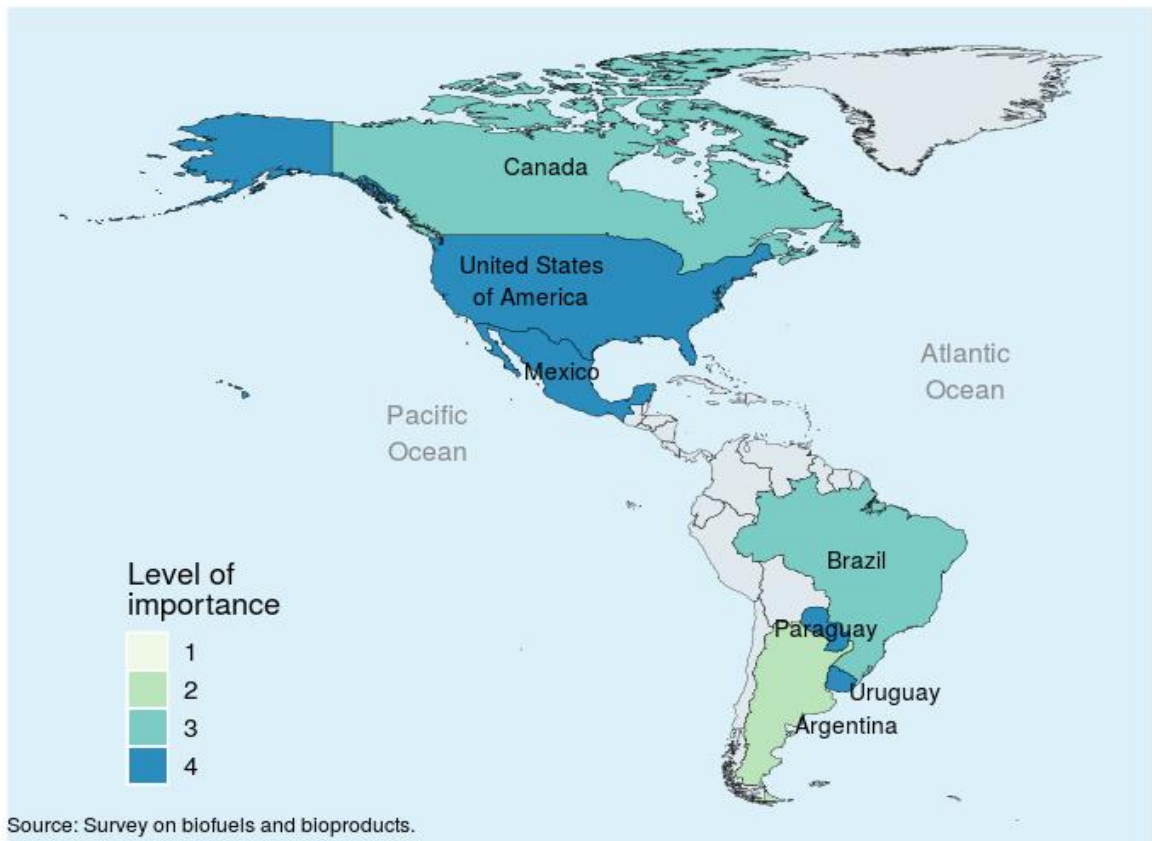
Question 28 - Feedstock supply



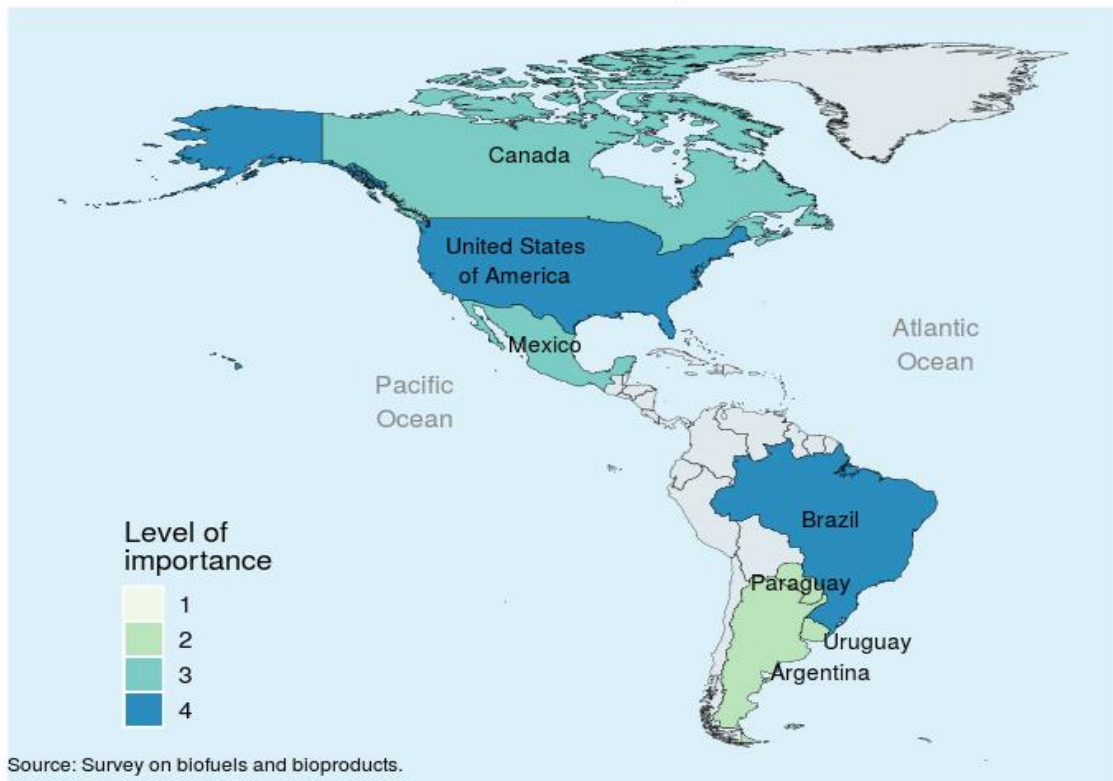
### Question 28 - Technological expertise



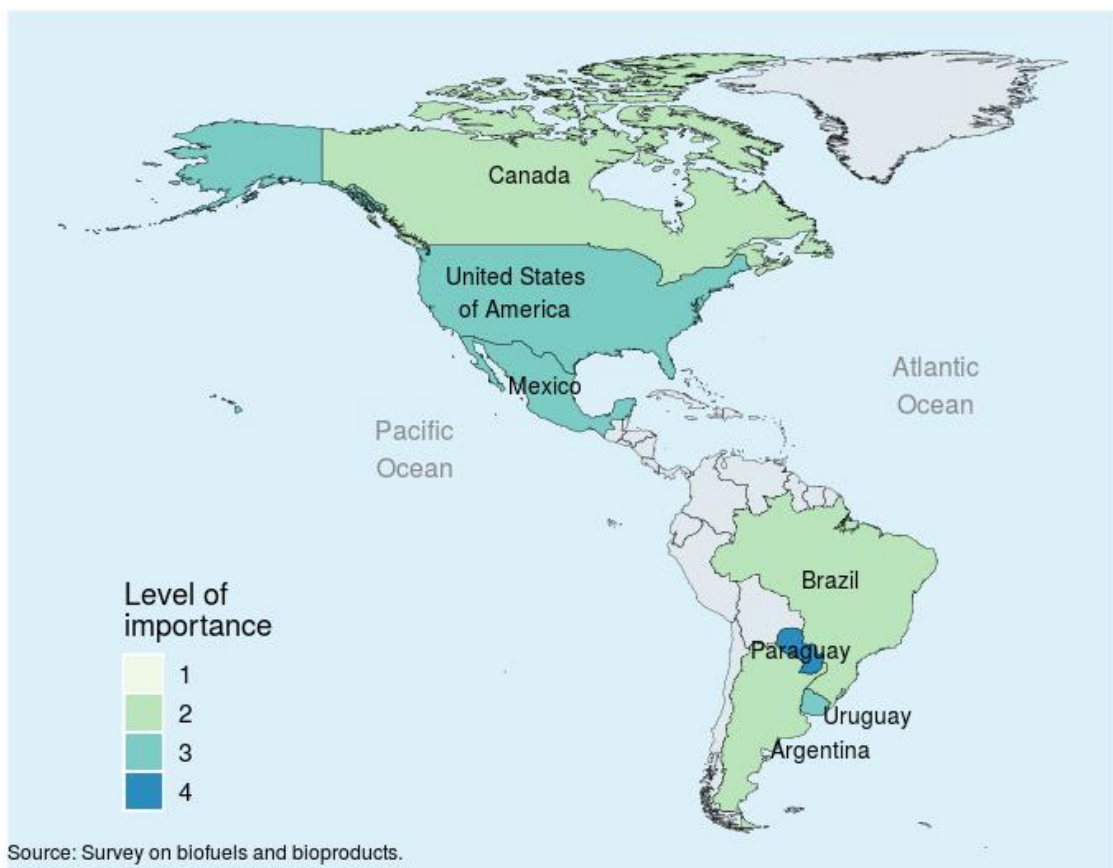
### Question 28 - Financial resources



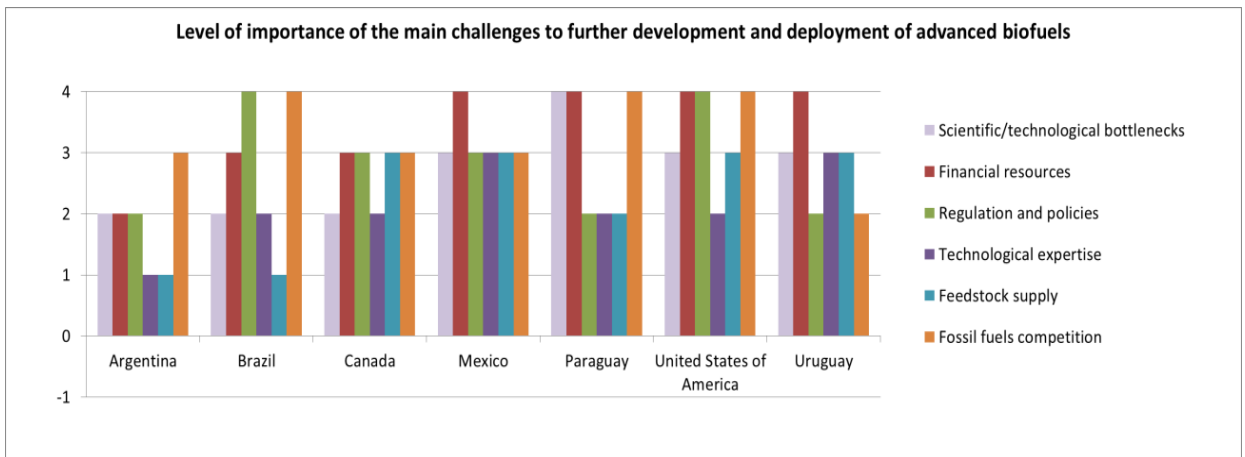
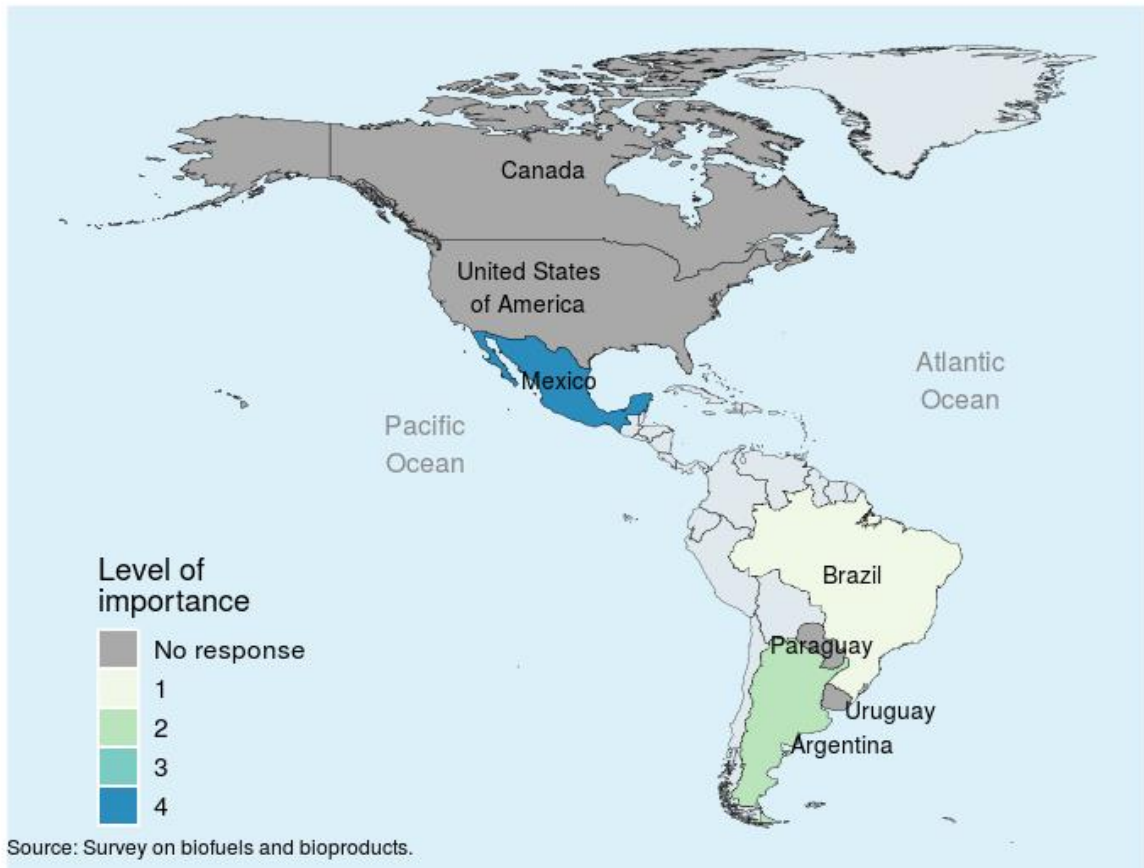
### Question 28 - Lack of policies



### Question 28 - Scientific bottlenecks



### Question 28 - Others



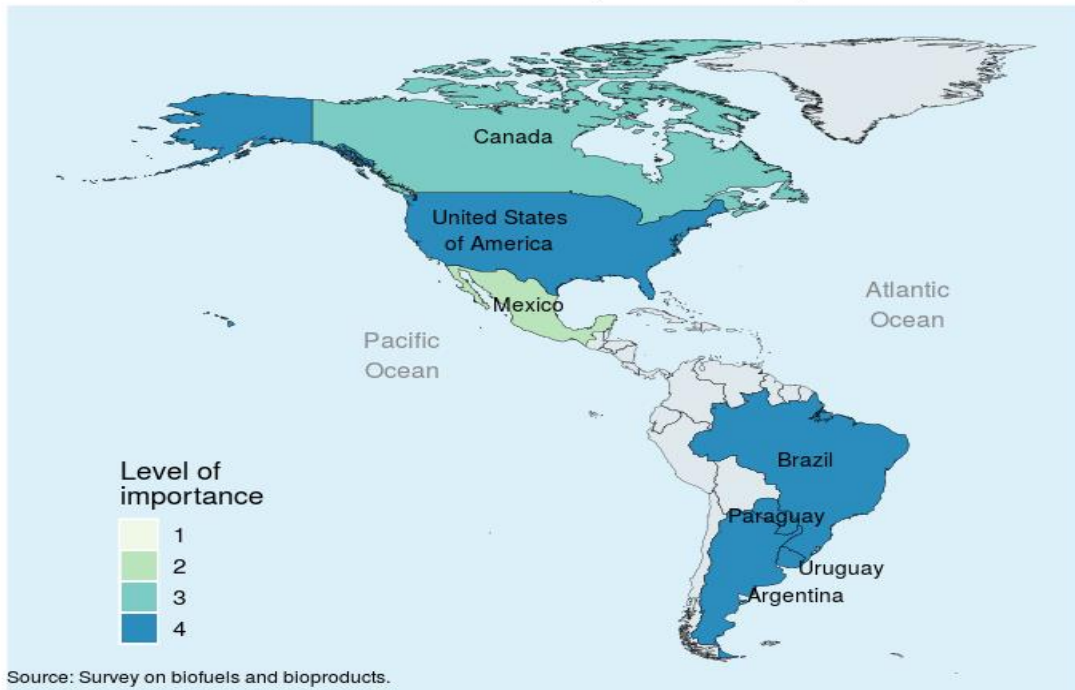
Level of importance: 1- irrelevant; 2 - relevant; 3 - important; 4 - very importante.

If others, specify.

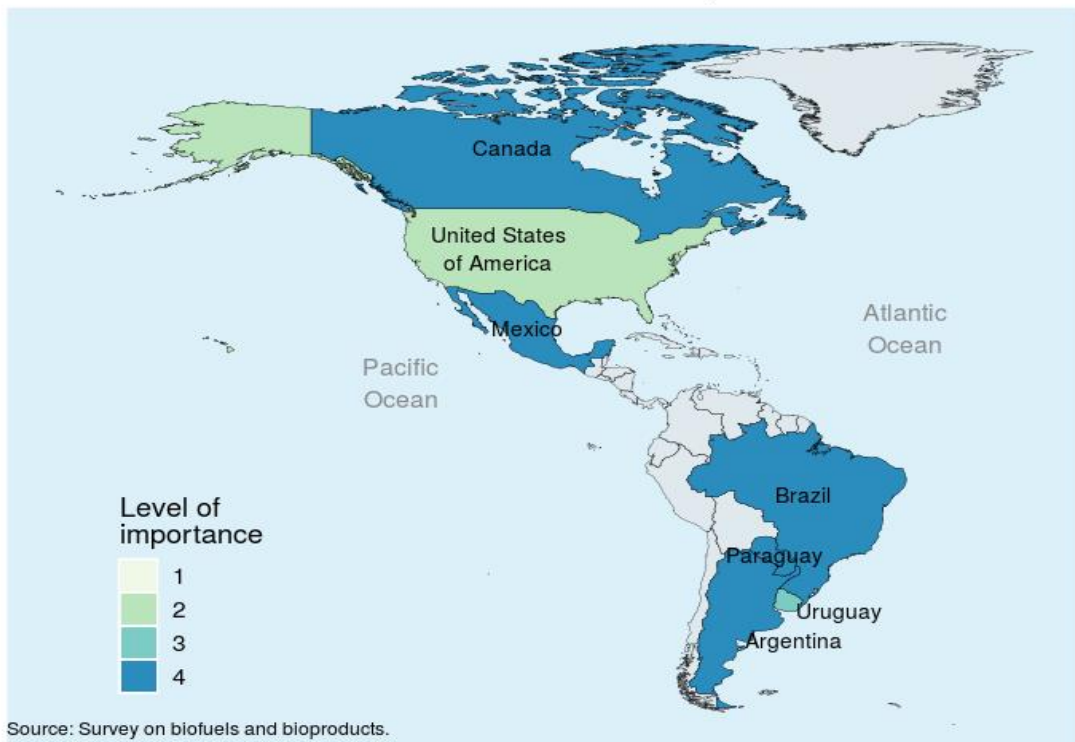
(Open question)

29. What would be the biggest challenges for the bioproduct production in your country? (1irrelevant; 4very important)

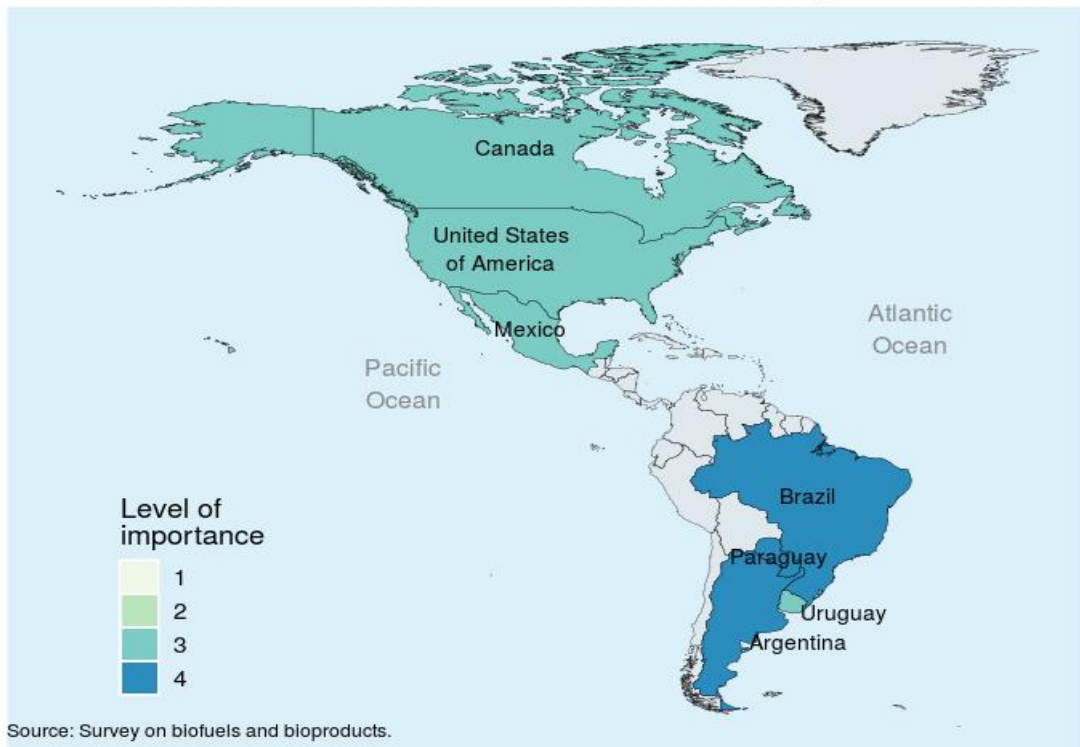
Question 29 - Fossil based products competition



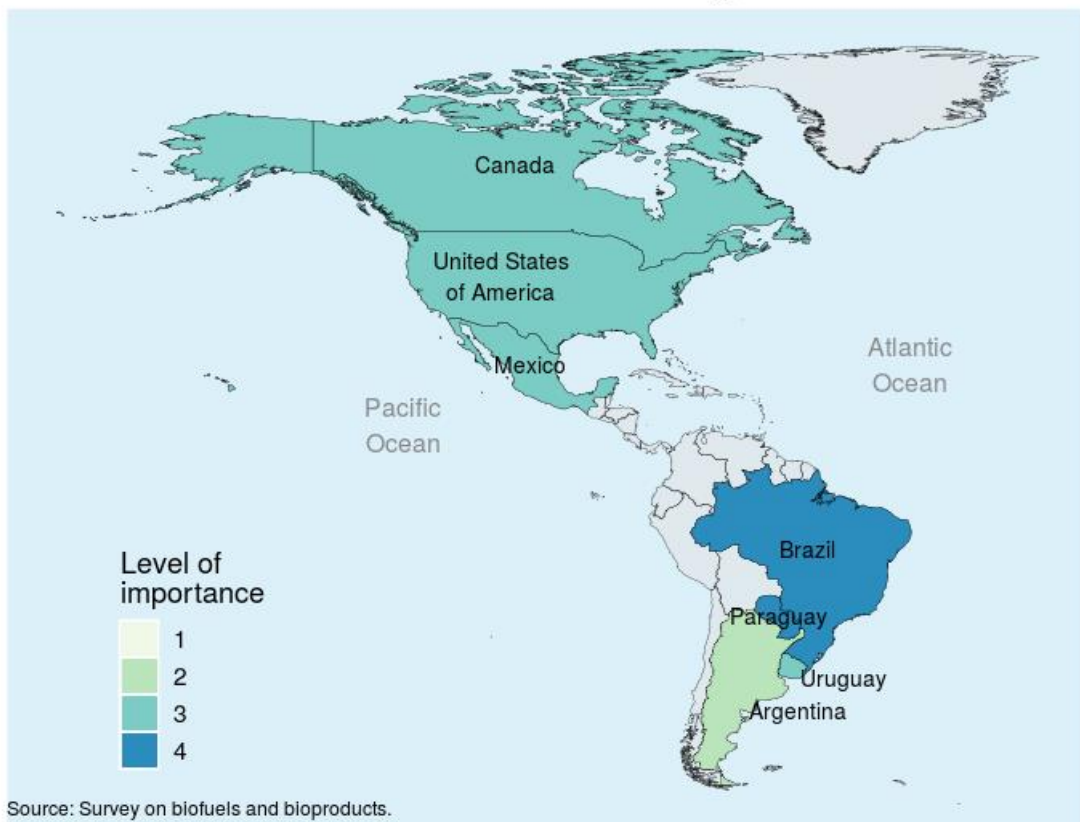
Question 29 - Market development



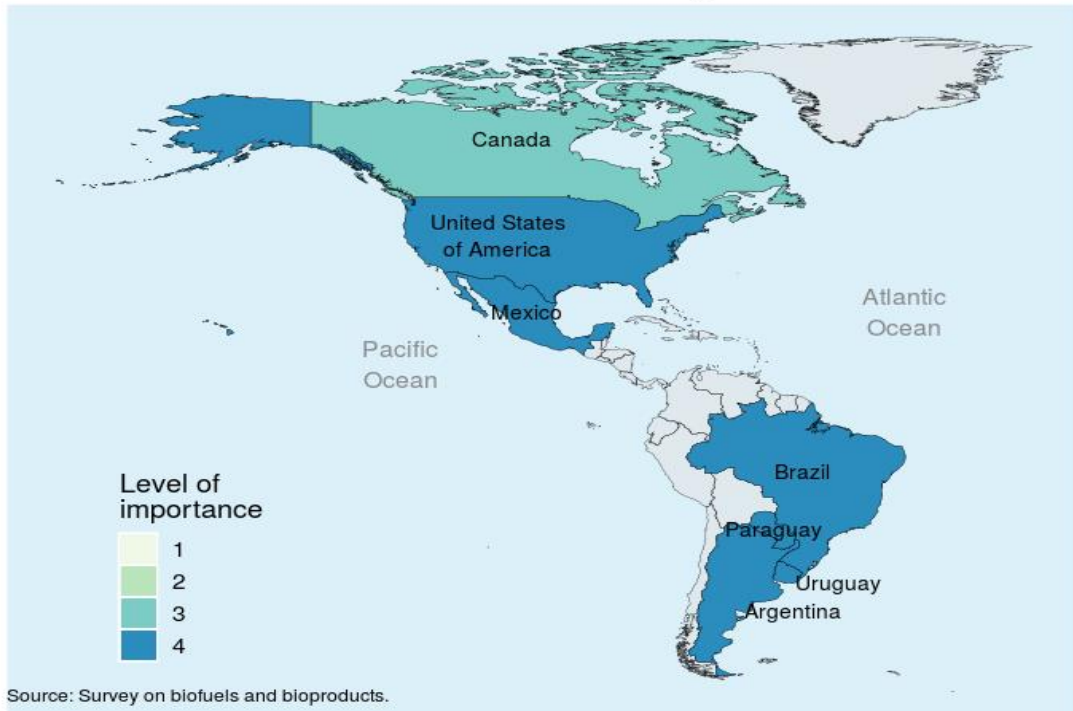
### Question 29 - Value chain structuring



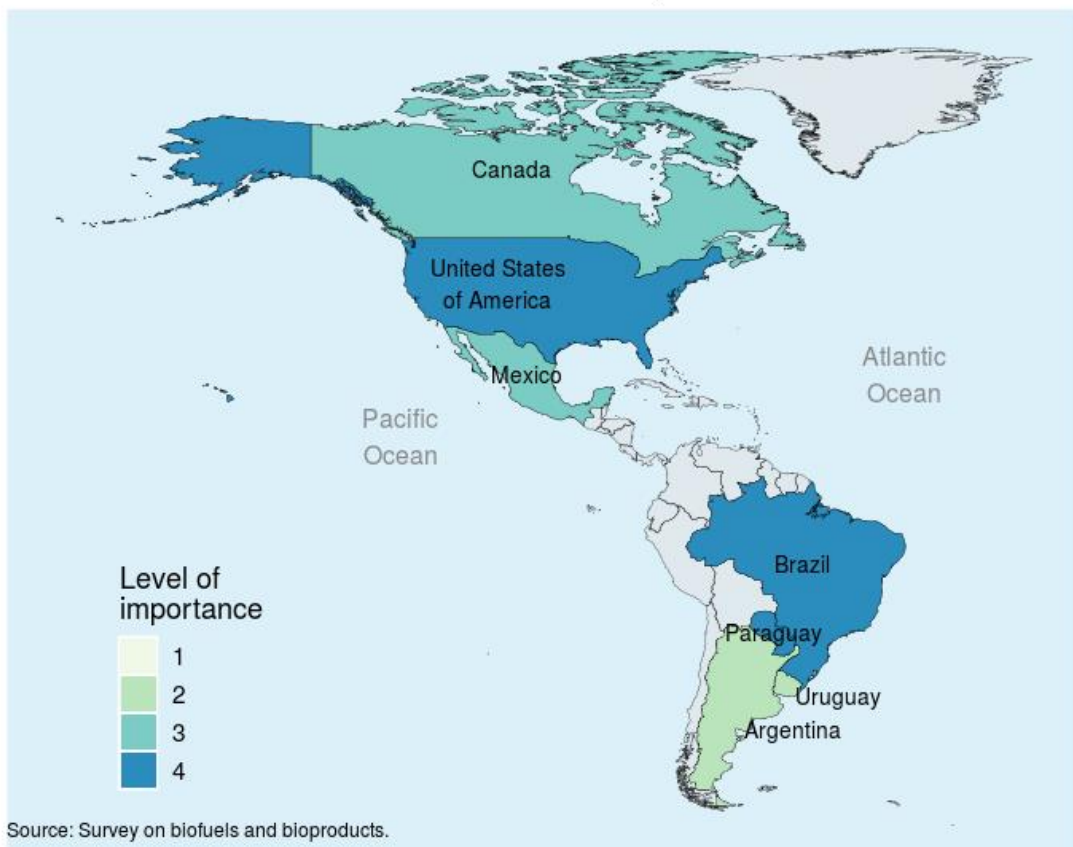
### Question 29 - Technology



### Question 29 - Funding

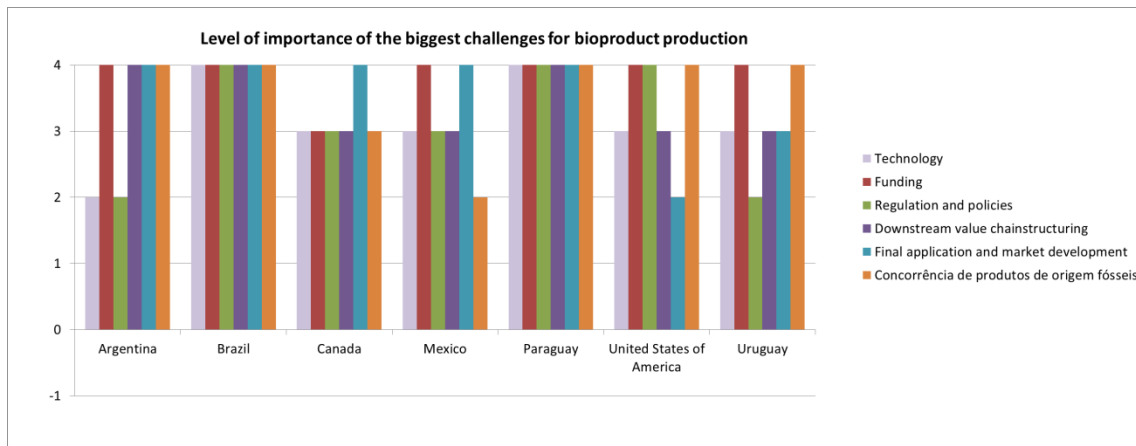
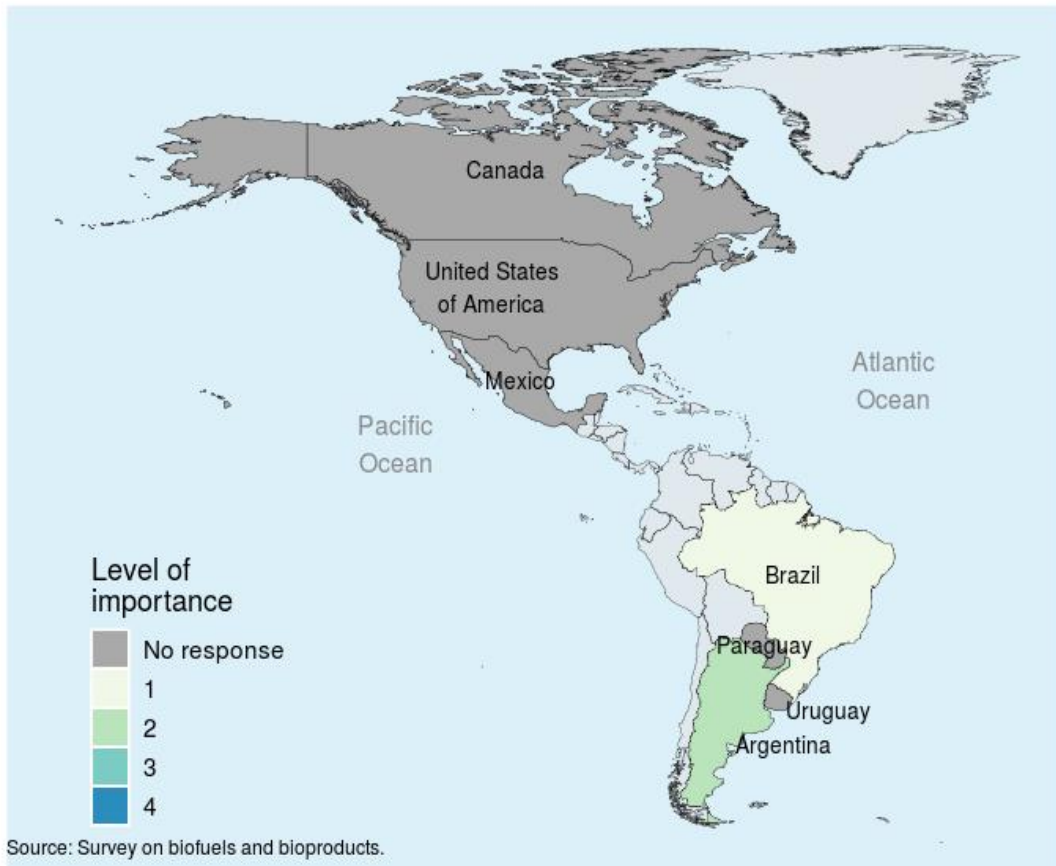


### Question 29 - Lack of policies

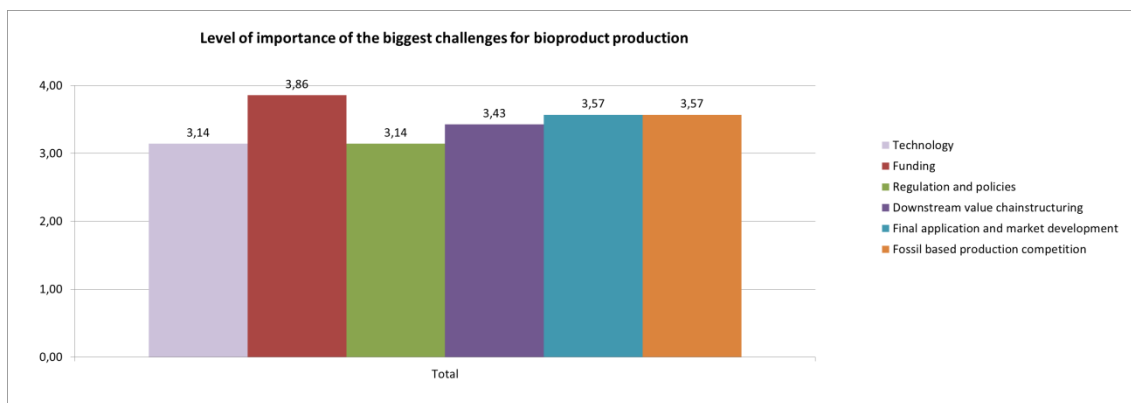




### Question 29 - Others



Level of importance: 1 - irrelevant; 2 - relevant; 3 - important; 4 - very importante.



Level of importance: 1 - irrelevant; 2 - relevant; 3 - important; 4 - very importante.

If others, specify

(Open question)

30. Is your country developing biofuels and bioproducts technologies?

Biofuels													
Country	Ethanol		Cellulosic ethanol		Biodiesel		Hydrogenated vegetable oil (HVO)		Aviation biokerosene		Feedstock development		
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	
ARGENTINA													
BRAZIL		X		X		X		X		X			X
CANADA		X		X		X		X		X			X
MEXICO		X		X		X	X		X				X
PARAGUAY		X	X			X	X		X			X	
UNITED STATES OF AMERICA		X		X		X		X		X			X
URUGUAY		X		X		X	X		X				X
<b>Total</b>	<b>0</b>	<b>6</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>6</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>5</b>	

Bioproducts													
Country	Feedstock development		Biochemicals		Biomaterials		Biopolymers		Biofertilizers		Others		
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	
ARGENTINA													
BRAZIL		X		X		X		X		X			X
CANADA		X		X		X		X		X			
MEXICO		X		X		X		X		X			
PARAGUAY	X		X		X		X		X				
UNITED STATES OF AMERICA		X		X		X		X		X			
URUGUAY		X		X		X		X		X			
<b>Total</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>1</b>	

If so, summarize and provide references.

(Open question)

31. What are the main research institutions in your country and what are their main areas of expertise and activity? (Institution/Research Focus(es)/Research Scale (Bench, pilot?)/Industrial partners(s)/N° researchers/Annual funds(U\$)/URL)

(Open question)

32. Update, in the space below, the information regarding the main commercial, demonstration and pilot developments in your country. (Project and location/Technology/Feedstock/Process/Product/Scale of Production/Date of Commissioning/PilotDemoCommercial/Status/URL)

(Open question)

33. What is the profile of the companies most interested in bioproducts?

Country	Biofuels	Chemicals	Petrochemicals	Oil & gas	Pulp and paste	Agribusiness	Food ingredients	Other
ARGENTINA								
BRAZIL	X	X	X	X	X	X	X	
CANADA	X	X	X	X	X	X	X	X
MEXICO	X	X		X			X	
PARAGUAY	X		X	X		X		
UNITED STATES OF AMERICA	X	X	X	X	X	X	X	
URUGUAY	X				X		X	

If other, specify.

(Open question)

34. Which are the main players with proprietary technology in your country? (Name/Technology/URL)

(Open question)

35. How many researchers in the fields of biofuels and bioproducts are currently working in your country?

(Open question)

36. What are the total investment in advanced biofuels and bioproducts in your country in the last 5 years?

(Inconsistent data)

Country	2012		2013		2014		2015		2016	
	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public
ARGENTINA										
BRAZIL										
CANADA										
MEXICO										
PARAGUAY										
UNITED STATES OF AMERICA										
URUGUAY										

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