

PARIS AGREEMENT ON CLIMATE CHANGE AND THE POSSIBLE IMPACTS ON BRAZILIAN MEAT AND DAIRY SECTORS

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June 17, 2020

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SUMMARY

- Motivations
- COP21, International Agreement
- Brazilian Agriculture and Trade
- Environmental Policies in Brazil
- The main objective
- Method: models, data and scenarios
- Results and contributions
- Main references

MOTIVATIONS

- A growing trend in Brazilian agricultural production and exportation with concentration in specialized regions.
- An intensive use of natural resources.
- Increasing the cultivated area, the deforestation and the use of fragile soils.
- Increasing the carbon emissions from fertilizer, herbicides and agricultural machinery (nonrenewable fuels).

PARIS AGREEMENT ON CLIMATE CHANGE

General :

- Keeping the increase in the global average temperature between 1.5° and 2°C above pre-industrial levels
- To increase the resilience to adapt to the impacts of climate change
- Making finance flows consistent with low greenhouse gas emissions and climate-resilient development

Brazil is committed with:

- Reducing the greenhouse gas emission levels by 37% until 2025 and 43% until 2030
- To restore 12 million hectares of forests
- To increase the share of biomass energy to 18% of the total energy use until 2030

BRAZILIAN AGRICULTURE AND TRADE

- Total agricultural area of 275 million hectares (32% of Brazil total area)
 - Farms with an area of 100 hectares or more are 9.6% of the total number of properties and occupy 78.6% of the total area.
 - Farms with less than 10 hectares are more than 50% of the total number of properties and occupy only 2.4% of the total area.
- Total forest area is 497 million hectares (58% of total area).

BRAZILIAN AGRICULTURE AND TRADE

- Regions and states of Brazil



BRAZILIAN AGRICULTURE AND TRADE

MAIN AGRICULTURAL SECTORS IN BRAZIL

- North region
 - Timber, crude rubber, tropical fruits, rice, soybeans and **beef**;
- North-east
 - Sugar, ethanol, tropical fruits, cocoa, rice, soybeans and **beef**;
- Centre-west
 - Grains (soybeans, corn and rice), **pork, chicken, beef**, cotton, ethanol;
- South-east
 - Tropical fruits, coffee, sugar, ethanol, soybeans, corn, **pork, chicken, beef**, cotton and **dairy products**;
- South
 - soybeans, corn, rice, wheat, **pork, chicken, beef**, timber, temperate fruits and **dairy products**, biodiesel.

TOTAL EXPORTS AND GROWTH RATES IN BRAZIL

Commodity	World rank	Market share	Total exports (2015)	Growth rates, 2006-15
	Exports	%	US\$ million	%
Fruit and vegetable juice	1	16	2.050	31
Soybeans	1	43	20,981	270
Beef	1	11	5,646	45
Poultry	1	21	6,926	99
Soymeal	2	22	5,821	141
Corn	2	22	4,938	973

ENVIRONMENTAL POLICIES IN BRAZIL

- Command and control instruments (direct regulation)
 - Ex: Permanent Preservation Area- APP (environmental role of preserving water resources, landscape, geological stability and biodiversity).
- Economic instruments
 - Ex: Carbon taxes
- Communication instruments
 - Ex: Environmental Education

MAIN OBJECTIVE

- The paper aims to analyze the possible impacts of reducing greenhouse gas (GHG) emissions on Brazilian Meat and Dairy sectors.

METHOD: MODELS, DATA AND SCENARIOS

- General Equilibrium (GTAP). according to the GTAP 9 database.

In the aggregation of regions, countries are assembled following criteria of trade partners and spatial proximity

REGIONS, SECTORS AND PRIMARY FACTORS IN THE GTAP MODEL

Regions	Sectors	Primary Factors
Africa (AFR)	Grains & Crops (GACO)	Capital
Argentina (ARG)	Cattle production (BECA)	Land
Brazil (BRA)	Chicken and pork production (CIPO)	Natural Resources
China (CHN)	Raw Milk production (RMIL)	Skilled Labor
East Asia (EAS)	Forestry (FORE)	Unskilled Labor
EU-25 (EUR)	Beef - industry (BEEF)	
North America (NAM)	Chicken and pork - industry (CHPO)	
Oceania (OCE)	Dairy-industry (DAIR)	
Rest of the Word (RW)	Industry & Services (INSE)	
Russia (RUS)	Energy (ENER)	
South Asia (SAS)		
Southeast Asia (STA)		
United States (USA)		

DESCRIPTIONS OF ALTERNATIVE SCENARIOS BY DIFFERENT CARBON TAXES

Scenarios	Description	Mitigation on agricultural sector in Brazil	Mitigation on other sectors in Brazil
(1) COP21-MEAT	Carbon taxes apply to the Brazilian Meat & Dairy sectors. (Econ. Instr.)	YES (20, 40, 60 \$/t)	NO
(2) COP21-ENIS	Carbon taxes applied to the Brazilian Energy sector. (Economic Instruments).	NO	YES (20, 40, 60 \$/t)
(3) COP21-All Sectors	Carbon taxes applied to all sectors in Brazil.	YES (20, 40, 60 \$/t)	YES (20, 40, 60 \$/t)
(4) COP21-MD-	Carbon taxes: lower taxes to Meat & Dairy sector.	YES (20, 40 \$/t)	YES (40, 60 \$/t)

GWP AND GTP EMISSION FROM ALL SECTORS (TON.) AND GROWTH (%) 2005-18 – BRAZIL

Sectors	2005		2018		% 2005-18	
	GWP (t.)	GTP (t.)	GWP (t.)	GTP (t.)	GWP	GTP
Meat & Dairy	400,022,781	114,435,703	408,675,212	117,924,190	2.2	3.0
Deforestation**	2,068,426,095	1,989,495,796	827,043,560	794,106,885	-60.0	-60.1
Grains & Crops	94,537,522	48,417,779	146,699,271	83,439,144	55.2	72.3
Industry & Services*	115,122,063	78,806,916	148,787,577	93,671,081	29.2	18.9
Energy	331,843,307	315,180,572	424,803,865	407,694,211	28.0	29.4
Carbon Sequestration	-446,394,750	-446,394,750	-529,451,505	-529,451,505	18.6	18.6
Total	2,563,557,019	2,099,942,016	1,426,557,980	967,384,005	-44.4	-53.9

RESULTS: VARIATIONS (%) IN GWP AND IN GTP EMISSIONS BY SECTORS IN ALL SCENARIOS

Scenario	Beef		Pork & Chicken		Dairy		Grains & Crops		Energy		Forestry		Ind. & Serv.		Total	
	GWP	GTP	GWP	GTP	GWP	GTP	GWP	GTP	GWP	GTP	GWP	GTP	GWP	GTP	GWP	GTP
1-20	-11.9	-2.7	1.7	1.6	-1.4	-0.3	0.7	0.2	0.6	0.1	-0.1	0.0	0.1	0.0	-2.4	-0.2
1-40	-24.5	-6.0	1.0	0.9	-3.0	-0.9	1.6	0.4	1.3	0.3	-0.2	-0.1	0.2	0.1	-5.0	-0.4
1-60	-37.1	-9.3	0.3	0.1	-4.6	-1.4	2.4	0.6	2.0	0.5	-0.3	-0.1	0.3	0.1	-7.6	-0.6
2-20	0.5	0.5	2.3	2.2	0.0	0.0	0.8	0.8	-6.8	-6.6	0.1	0.1	0.2	0.2	-1.7	-2.5
2-40	1.1	1.1	4.8	4.6	0.1	0.1	1.8	1.7	-14.5	-14.0	0.2	0.2	0.4	0.4	-3.7	-5.2
2-60	1.7	1.7	7.3	7.0	0.1	0.1	2.7	2.6	-22.1	-21.3	0.2	0.2	0.6	0.1	-5.6	-8.0
3-20	-12.0	-3.0	0.9	0.3	-1.5	-0.4	-1.1	-1.1	-7.7	-8.1	0.3	0.3	0.5	0.4	-4.6	-3.2
3-40	-23.7	-5.5	4.1	2.7	-3.0	-0.9	-0.5	-0.6	-14.2	-15.0	0.2	0.4	0.8	0.6	-9.1	-6.1
3-60	-35.3	-8.1	7.1	5.2	-4.5	-1.4	0.1	0.0	-20.6	-21.9	0.2	0.4	1.1	0.8	-13.5	-9.0
4-20/40	-11.2	-2.4	3.9	2.7	-9.2	-0.4	0.2	-0.2	-15.1	-15.5	0.3	0.4	0.7	0.6	-6.7	-6.0
4-20/60	-10.6	-1.9	6.9	4.9	-1.3	-0.4	1.1	1.7	-22.5	-22.9	0.4	0.4	0.8	0.7	-8.4	-8.7
4-40/60	-23.0	-4.9	7.0	5.1	-2.9	-0.9	0.6	0.3	-21.6	-22.4	0.3	0.4	1.0	0.8	-10.9	-8.8

RESULTS: VARIATIONS (%) ON BRAZILIAN EXPORTS AND GDP TO GWP AND TO GTP - ALL SCENARIOS

	Exports								GDP	
Scenario	Beef		Pork & Chicken		Dairy		Total			
	GWP	GTP	GWP	GTP	GWP	GTP	GWP	GTP	GWP	GTP
1-20	-73.9	-16.5	3.9	3.7	-16.8	-3.6	1.5	0.4	-0.3	-0.1
1-40	-152.1	-37.1	2.6	2.0	-37.3	-10.9	3.0	0.8	-0.5	-0.1
1-60	-230.2	-57.9	1.3	0.5	-57.8	-18.1	4.4	1.2	-0.8	-0.2
2-20	5.1	4.9	5.5	5.4	5.5	5.3	2.4	2.3	-0.9	-0.8
2-40	10.4	10.4	11.3	11.3	11.1	11.1	4.9	4.9	-1.8	-1.8
2-60	16.5	16.7	17.9	18.2	17.6	17.9	7.7	7.8	-2.8	-2.8
3-20	-74.9	-15.9	2.3	0.6	-18.2	-5.3	-1.0	-2.4	-0.3	0.0
3-40	-144.2	-32.2	10.3	6.7	-29.6	-6.0	4.1	1.1	-1.8	-1.2
3-60	-213.8	-45.8	18.1	12.9	-41.2	-5.7	9.1	4.6	-3.3	-2.3
4-20/40	-68.5	-13.3	9.7	6.6	-10.9	-0.4	2.4	0.2	-1.4	-0.9
4-20/60	-61.5	-8.5	16.9	12.1	-3.9	5.0	5.6	3.0	-2.5	-1.9
4-40/60	-137.6	-26.75	17.4	12.7	-22.5	-0.11	7.3	3.7	-2.9	-2.1

FINAL REMARKS

- Brazil has already achieved the goals in the Paris Agreement until 2018, following the SEEG database.
- The main instrument of environmental policy in Brazil is the command control. But, the possible adoption of economic instruments to reduce GHG emissions has potential to place Brazil as a proactive country in the global warming mitigation
- This GHG emission pattern will not be maintained as long as meat production in Brazil increases.
- Remembering, the meat production in Brazil put pressure on forest areas to be converted into pasture or into soy and corn crops.

FINAL REMARKS

- Considering the carbon taxes scenarios using GWP, there are a bigger penalty to the sectors that emit a higher methane proportion, as Beef production.
- For instance, applying carbon taxes to all sectors using GTP can be an alternative strategy to minimize the negative effects upon Beef and Dairy production.
- Another possibility is to apply different carbon taxes by sectors using GWP. In this case, the best scenarios are the 4-20-60 or 4-20-40, both with lower taxes to agriculture sector.

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An aerial photograph of the PUCRS campus in Porto Alegre, Brazil, showing various academic buildings, green spaces, and a river in the background. The image is darkened to serve as a background for the text.

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