Climate action and economic diversification: Renewable Energy, Amazon protection and Açaí production in Brazil

Joaquim Bento de Souza Ferreira Filho

Escola Superior de Agricultura "Luiz de Queiroz" - ESALQ

University of São Paulo - USP

Background

- Climate change raises concerns about the traditional development model based on natural resources exploitation.

- New research methodologies allow the assessment of diversification options in the economy.

- Present two cases of economic diversification in Brazil, using two different methodologies:

  - The potential of non-timber resources in the Amazon forest as a source of employment and income: <u>Social Accounting Matrix</u> (SAM) of the Amazon region.

  - The impacts of biofuels policies in Brazil: the biodiesel and ethanol mandates. <u>General equilibrium model.</u>

Deforestation reduction

- Key for the Brazilian iNDC.

- <u>To which extent are the economic activities inside the Amazon Forest feasible development alternatives?</u>

- ILO commissioned a study on the structure of labor demand in the Amazon region.

- Timber and non-timber activities.

- Methodology: a Social Accounting Matrix (SAM) of the Amazon Forest region.

- Co-author: Arlei Luiz Fachinelo.

A SAM for the Brazilian Amazon

- Two main purposes:

- Estimate the number of jobs in the forest economic activities: non-timber activities (natural rubber, Brazilian nuts, Açaí); timber (charcoal, firewood and lumber), fishing (extractive and aquaculture).

- Estimate of employment and income multipliers, for impact analysis.

- This research relied extensively on local information for operational costs of activities, as well as with expert interviews.

Main results

- The forest sector contribution to regional GDP is higher in the Amazon region (5.3%) than in Brazil (1.3%).

- Employment in vegetal extraction and forestry sector:
  - 525,000 workers (8.7% of total regional employment). Higher then previous estimates.
  - 122,000 jobs in timber extraction (25% of total forest activities, 1.4% of total regional employment).

- Forest employment labor structure is more concentrated in the lowest wages than in the other regions of Brazil.

Multipliers and linkages

Activity	Multipliers			Weighted Linkage Indices	
	Product	Income	Employment	Backward (BIL)	Forward (FIL)
Agriculture	2.04	1.10	151	1.11	1.36
Timber Extraction	2.00	1.31	122	1.13	0.09
Charcoal Extraction	2.00	1.27	58	1.11	0.01
Rubber extraction	2.02	1.33	718	1.14	0.00
Brazil Nuts Extraction	1.99	1.16	249	1.02	0.00
Açai Berry Extraction	2.01	1.16	157	1.03	0.01
Extraction of Other Products	2.00	1.11	157	1.01	0.01
Timber Forestry	1.81	0.79	63	0.84	0.01
Charcoal Forestry	1.96	0.72	49	0.74	0.00
Other Forestry Products	1.88	1.08	44	0.00	0.00
Mineral Extraction	2.25	1.06	35	1.35	0.63
Agroindustry	2.62	0.96	82	1.20	1.69
Brazil Nut Processing	2.38	1.22	131	1.08	0.00
Açai Berry Processing	2.51	1.15	141	1.03	0.02

Regional development option?

- Results show high employment multipliers for non-timber products: Açaí, Brazil nuts, natural rubber.

- High backward linkages.

- Low forward linkages: short local value chains, high economic leakages to other regions (southeast Brazil).

- Better structuring of local value chains for forest products is a challenge for local development.

- Impacts of domestication: Açaí plantations in "high lands" with irrigation in the dry season.

- Forest non-timber products: niche products?

Biodiesel and ethanol

- Brazilian National Energy Plan 2030 (PNE 2030): part of the National Climate Change Policy (PNMC).

- Mandates for fuel blending: gasoline+etanol, diesel+biodiesel.

- This study analyzed the impacts of the biodiesel and etanol mandates on the economy for the 2010-2030 period.

- Co-author: Jeronimo Santos.

- Methodology: a general equilibrium model of Brazil (TERM-BR model):
  - Inter-regional (27 regions), bottom-up.
  - GHG emissions module.

Simulation

- Initially a base line for the economy was created: business as usual growth path.

- Inclusion of the PNE biofuels hypothesis and mandates:
  - Increase of household ethanol consumption by 5.6% per year (200% between 2010 and 2030).
  - Increase of <u>biodiesel</u> blend to <u>diesel</u> to B10 (10%). Implied rate of increase of biodiesel of 7.9% per year (360% between 2010 and 2030).
  - Impacts are the difference between the baseline and the policy model results.

Results: percent change in relation to the baseline

MACROS	% change due to	
	Biodiesel	Ethanol
Real household	0.024	0.01
Real investment	0.086	0.023
Real government	0.029	0.014
Real exports	-0.298	-0.099
Real imports	-0.126	-0.113
Real GDP	0.024	0.01
Real wage	0.072	0.029

EMISSIONS	% change due to	
	Biodiesel	Ethanol
Oi and gas extraction	-3.941	-1.945
Coal	-0.162	-0.049
Gasoline	0.221	-2.082
Gasoline C (ethanol blend)	0.032	-12.646
Combustible oil	0.292	0.459
Diesel oil	-11.166	0.106
Other refined products	0.383	0.026
Activity	0.125	0.342
Total emissions	-1.9	-0.6

Latin America and Caribbean (LAC) awareness creation workshop.

Results: percent change in relation to the baseline

Real wages - % change due to			Real HH consumption		
	Biodiesel	Ethanol	HH income	Biodiesel	Ethanol
1 OCC1 (lowest)	0.20	0.15	POF1 (lowest)	0.17	0.26
2 OCC2	0.19	0.14	POF2	0.15	0.21
3 OCC3	0.19	0.18	POF3	0.13	0.19
4 OCC4	0.12	0.13	POF4	0.09	0.08
5 OCC5	0.12	0.14	POF5	0.10	0.10
6 OCC6	0.16	0.12	POF6	0.07	0.10
7 OCC7	0.20	0.16	POF7	0.07	-0.01
8 OCC8	0.11	0.10	POF8	0.01	-0.03
9 OCC9	0.08	0.00	POF9	-0.10	-0.12
10 OCC10 (highest)	0.02	-0.04	POF10(Highest	-0.10	-0.16

Final remarks

- Biofuels mandates have positive economic effects in Brazil.

- Positive emissions effects: 0.13% per year reductions in GHG emissions until 2030.

- Even higher for the new mandates (B15, B20).

- Different regional effects, not discussed here.

- Thank you.

- jbsferre@usp.br