Biotechnologies, Biomass, Agroecology: Which Bioeconomic Approaches Do Argentinean Enterprises Follow?

Jochen Dürr, ZEF, University of Bonn, Germany
Marcelo Sili, Universidad Nacional del Sur, Argentina

RESEARCH BACKGROUND

The bioeconomy continues to be a contested field in the political debate.

The most prominent bioeconomy approaches focus on bio-technology (OECD, 2009) and bio-mass (EU, 2012). Different ideal types have been described in literature (see Table 1).

Alternative concepts with a more socio-ecological vision and strong local embeddedness are usually under-represented in the debate.

Different bioeconomic approaches in rural areas might follow different logics and generate different outcomes for local development, benefiting varying actors, such as small- or large-scale producers.

In Argentina, the bioeconomy is mainly linked to genetically modified monoculture crops, intensive use of inputs, and export orientation, with a bio-technological and agro-industrial focus.

Table 1: Different bioeconomic approaches described in literature

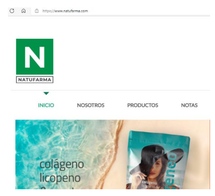
	Bio-technological approach <----------> *Socio-ecological approach*			
Bugge et al. (2016)	Biotechnological vision (biotechnologies, markets, growth)	Bioresource vision (upgrading bioressources, optimizing land use and waste)		Bio-ecology vision (conservation, territorial identity, sustainable agroecological practices, transdiciplinary sustainability)
Priefer et al. (2017)	Technology based (biotechnologies, patents, multinational companies and global value chains, competitiveness, innovations)		Socio ecological approach (multifunctional, ecological agriculture, reduced resource consumption, social innovations, local knowledge, transdisciplinary research)	
Vivien et al. (2019)	Biotechnology based economy (science)	Bio-based economy (replacing fossil fuels by biomass)		Ecological economy (respecting the limits of the biosphere)
Hausknost et al. (2017)	Sustainable capital (bio-technologies and industrial innovations)	Planned transition (high tech vision and sufficiency approach)	Eco-growth (agro-ecological innovations)	Eco-retreat (ecological practices and socio-economic suficiency)
Levidow et al. (2019)	Life science trajectories (modifying plants and animals conversion of biomass, lab knowledge and bio-refinery)		Agro-ecological trajectories (minimize external input use, territorial identity, small-scale farming)	

METHODS

- Online survey questionnaire applied to 47 enterprises all over Argentina
- 19 variables to describe the bioeconomic approaches in terms of biomass use, size, technology, and territorial embeddedness
- Use of a 5-point Likert scale for ordinal variables
- Hierarchical Cluster Analysis to detect bioeconomic models
- Lower Likert scale levels (green) would represent the socio-ecological approach, higher levels (red) the bio-tech and biomass approach, see Table 2

RESEARCH QUESTIONS

1. Can the ideal types of approaches be clearly distinguished in the case of Argentina?
2. What are the characteristics of the different bioeconomic approaches?
3. How are the enterprises of the different models embedded in the rural territories?



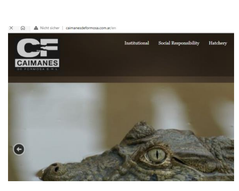


Table 2: Identified bioeconomic clusters and their characteristics (% of enterprises belonging to each level)

Variables	Fisher exact	Cluster 1. Biomass (n=21)	Cluster 2. Biotechnology (n=15)	Cluster 3. Bioembedded (n=11)
Biomass volume used	51.3** (.000)	> 1000 tn: 71%	< 10 tn: 73%	< 10 tn: 82%
Origin of biomass	6.3 (.346)	local: 71%	local: 53%	local: 82%
Scale of biomass production	15.9* (.025)	medium: 48% very high: 29%	small, very small, medium: 27%	very small: 64%
Intensity of biomass production	12.6 (.092)	medium: 38% low: 24%	no use: 47%	no use: 36% low: 36%
Size: No. of Employees	19.5** (.005)	101-500: 33% >500: 24%	1 - 5: 33% 6 - 20: 33%	1 - 5: 45% 6 - 20: 27%
Use of Bio-**Technologies**	28.4** (.000)	level 2: 43% level 1, 3: 19%	level 5: 60%	level 2: 64%
Use of local knowledge	8.8 (.324)	level 2: 38% level 3: 29%	level 1: 33% level 4: 27%	level 3: 45% level 1, 2: 18%
Use of patents	7.5 (.490)	level 1: 57%	level 1: 60%	level 1: 45% level 2: 27%
Importance of scientif. cooperation	4.7 (.848)	level 4: 38% level 3: 29%	level 4: 33% level 2: 20%	level 3: 27% level 4: 27%
Importance of private sector cooperation	6.1 (.682)	level 4: 38% level 2, 3, 5: 19%	33% level 1 27% level 4	45% level 4 18% level 3,5
Territoriality: Main markets served	5.3 (.486)	national: 48% international: 29%	national: 53% international: 27%	national: 73% international: 27%
Main suppliers of inputs	12.9* (.022)	national: 76% local: 14%	international: 40% national: 40%	national: 36% international: 27%
Influence of internat. prices on profit.	3.5 (.790)	very high: 33% high: 29 %	high: 47% medium: 33%	medium: 36% high, very high: 27%
Local identity of products	3.3 (.986)	much: 33% very much: 29%	medium: 33% much: 33%	very much: 36% much: 36%
Contribution to the environment	8.7 (.341)	very much: 38% much: 24%	much: 53%	much: 36% very much, medium: 27 %
Sustainable use of natural resources	8.9 (.304)	much: 43% very much: 38%	much: 33% not much: 27%	very much: 36% much: 27%
Cooperation with local Stakeholders	11.5 (.115)	much: 52% very much: 33%	much: 47% medium, not much: 20 %	much: 45% not much: 27%

OUTCOMES

Argentina's bioeconomy is path dependent, but new development paths are opening up.

Bioeconomic models in Argentina are partly consistent with contemporary conceptual approaches, but there is diversity within the clusters.

All bioeconomic models are linked to the territory, but the clusters are locally embedded in different ways: Cluster 3 is especially locally embedded ("bio-embedded model"), with high local identity.

Although the clusters identified show clear differences in the use of biomass, technology, and in size of the companies, there are two common elements: 1) a focus on sustainability and innovation, and 2) building networks with other actors in the territory.

Contact:
jduerr@uni-bonn.de

Tropentag, September 14-16, 2022, hybrid conference
"Can agroecological farming feed the world? Farmers' and academia's views"

Supported by the German Federal Ministry of Education and Research and the BioScience Center of the Federal State of Nordrhein-Westfalen