Assessing Sustainability – The GBEP Sustainability Indicators for Bioenergy in Paraguay

Constance Miller and Tiziana Pirelli

Global Bioenergy Partnership Food and Agriculture Organization of the United Nations (FAO)

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The Global Bioenergy Partnership (GBEP)



International initiative established to implement the commitments taken by the **G8 in 2005** and receiving renewed mandates from **G7 and G20** since then.

Brazil is the co-Chair. Second co-Chair under nomination. FAO is a founding partner and hosts its Secretariat at FAO HQ in Rome.

38 Partners and 46 Observers

(Governments and International Organizations)



Focus on SUSTAINABILITY

The Global Bioenergy Partnership (GBEP)

has developed the most widely recognized and agreed set of indicators for the assessment and monitoring of bioenergy sustainability.

Key points:

- All forms of bioenergy
- Voluntary Are not legally binding
- Scientific basis for policy formulation
- Facilitate a harmonization of sustainability assessments

GBEP sustainability indicators for all types of bioenergy



Global Bioenergy Partnership Sustainability Indicators for Bioenergy: Implementation Guide

January 2020

GLOBAL BIOENERGY PARTNERSHIP

WORKING TOGETHER FOR SUSTAINABLE DEVELOPMENT

Final Draft

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GSI – MNV Tool

Measured over time, the indicators show progress towards or away from a sustainable development path as determined nationally.

Tool to Measure, Notify and Verify (MNV) the achievement of:

- Nationally Determined Contributions (NDCs)
 - e.g. to evaluate the effectiveness of adopted P&M and/or the efficient use of funds to achieve reduced GHGs emissions;

Sustainable Development Goals (SDGs)



Links between GSI and SDGs

Sustainable development goals, targets and indicators			als,	GBEP Sustainability Indicators for Bioenergy (GSI)		
SDG	Target	Indicator	Tier	GSI		
1 5	1.1	1.1.1	1	10. Price and supply of a national food basket		
A.++.+	1.2	1.2.1 1.2.2	1	11. Change in income		
	1.4	1.4.2	ш	9. Allocation and tenure of land for new bioenergy production		
2 :::::: 	2.1	2.1.1 2.1.2	1	10. Price and supply of a national food basket		
	2.3	2.3.1 2.3.2	ш	9. Allocation and tenure of land for new bioenergy production		
	2.4	2.4.1	=	7. Biological diversity in the landscape 2. Soil quality		
	2.c	2.c.1	Ш	10. Price and supply of a national food basket		
	3.9	3.9.1	1	15. Change in mortality and burden of disease attributable to indoor smoke		
⁵ @ "	5.4	5.4.1	Ш	13. Change in unpaid time spent by women and children collecting biomass		
6 min with	6.3	6.3.1 6.3.2	 	6. Water quality		
Ŷ	6.4	6.4.1 6.4.2	11 1	5. Water use and efficiency		
7 11000011.000 	7.1	7.1.1 7.1.2	1	14. Bioenergy used to expand access to modern energy services		
- 7FC	7.2	7.2.1	1	 Bioenergy used to expand access to modern energy services Energy diversity 		
	7.3	7.3.1	1	19. Gross value added 22. Energy diversity		
	7.a	7.a.1	111	all GBEP work		
8 CONTRACTOR	8.1	8.1.1	1	19. Gross value added		
1	8.2	8.2.1	1	12. Jobs in the bioenergy sector		
	8.3	8.3.1	- 11	12. Jobs in the bioenergy sector		
	8.5	8.5.1 8.5.2		11. Change in income		
	8.8	8.8.1 8.8.2	1	16. Incidence of occupational injury, illness and fatalities		

 All GSIs from the environmental and social pillars and the majority from the economic pillar are linked to SDGs and their targets and indicators

 GSI implementation can support data collection for SDG monitoring



Source: Fritsche et al. 2018

Implementation of the GSI



GSI implemented by FAO in **Colombia, Indonesia, Viet Nam and Paraguay**

Main objectives:

- Create country ownership and ensure participation of all stakeholders
- Strengthen the capacity of national institutions to assess bioenergy sustainability through ongoing training and support
- Use results to inform bioenergy policy-making (within the context of low-carbon development) and to set the basis for a longterm monitoring of bioenergy sustainability



Sustainability of forest biomass for energy and of ethanol from maize and sugarcane in Paraguay: Key results and recommendations

Forest biomass for bioenergy





Ethanol from sugarcane and maize



Forest biomass for bioenergy: household demand

Despite having one of the highest electrification rates in Latin America, (100% of urban households and 98% of rural households have access to electricity), 50% of rural population still use traditional energy (e.g. open fire) for cooking and heating.



Author's elaboration based on MOPC, VMME y GIZ, 2013; y MOPC-VMME, 2015

Household demand for woodfuel: 4 100 000 - 6 100 000 t/y



Forest biomass for bioenergy production: industrial demand

Sector	Amount (tonnes)			
Sector	from	to		
Agro- industry	1 600 000	3 000 000		
Charcoal production	1 480 000	1 480 000		
Oil	350 000	400 000		
Ceramics	200 000	230 000		
Alcohol and Sugar	132 000	253 000		
Chips	60 000	80 000		
Meat and dairy	56 000	64 000		
Cassava starch	32 000	35 000		
Tobaccos	37 000	37 000		
Other	468 000	468 000		
Total	4 415 000	6 047 000		

Author's elaboration based on MOPC, VMME y GIZ, 2013

- Annually, more than
 500 000 tonnes of
 woodfuel required to
 dry soybean
- 24-33% of woodfuel is used to produce charcoal for export
- Scarce data availability on types and efficiencies of technologies used



Supply and demand of forest biomass for bioenergy

The supply of **wood from sustainable production is not sufficient** to cover its current demand at the household and industrial levels

	Sectors	From… (t/y)	to (t/y)
	Household	4 100 000	6 100 000
Demand	Industrial	4 415 000	6 047 000
	Total	8 515 000	12 147 000
Sustainable forest biomass supply for bioenergy production	Total	927 560	1 162 365
Net balance	Total	-7 587 440	-10 984 635

Author's elaboration based on MOPC, VMME y GIZ, 2013

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This negative balance is one of the major drivers of deforestation in Paraguay after forest conversion to agricultural land and pastures

Eucalyptus chips and charcoal value chain: GHG emissions

Eucalyptus chips for bioenergy	gCO ₂ eq/M J
Use	0.40
Processing	0.10
Transport	2.00
Cultivation	5.20
LUC	3.10
Total	10.80

Author's elaboration as part of LCA for Ind. 1





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- 1.Incentivize the sustainable management of productive native forests, for example, through the adoption of policies and appropriate incentives for sustainable forest management practices.
- 2.Maximise control over, and sanction of, deforestation and of the illegal trade of forest products and by-products.
- 3.Guarantee the **traceability** of biomass products and by-products (e.g. charcoal) GBEP

Following the recommendations... PROEZA

- GCF PROEZA a USD90 million project to combat climate change, hunger and poverty in Paraguay
 - Support Sustainability Standards (socioenvironmental) for the forestry sector
 - Understand needs to modify the legal framework applicable to the forestry and environmental sector
 - Build a roadmap for the creation of a national forest certification scheme
 - Support the National Plan for Efficient Wood-fired Stoves
 - Promote Forest Plantations



Sugarcane and maize-based ethanol



In 2016 ethanol was produced from:

- grains (56%) = 82 637 ha of maize;
- Sugarcane (44%) = 33 668
 ha

Accounted for around 28% of total gasoline consumption, reducing country dependence on fossil fuel imports



Ethanol vs. gasoline: GHG emissions savings compared to gasoline

- Greatest GHG emission savings for maizebased ethanol
- LUC: lower in maize that is cultivated in crop rotation
- Sugarcane yield: lower at PE (40 vs. 65 t/ha)
- Ethanol yield: higher in case of sugarcane: Use
 - 76.5 GJ/ha
 - 31.1 GJ/ha





Water and soil quality



RESULTADOS DE ANÁLISIS DEL RÍO TEBICUARY EN TEBICUARY-MI

Data on soil and water quality in areas of production of feedstock and ethanol are in general insufficient for thorough sustainability assessment and monitoring.

	Jun/051	Ago/05 ¹	Nov/051	Feb/051	Set/17 ²	Set/17²	Limites SEAM Res. 222/02 para la clase l
рН	7,2	6,8	6,8	6,3	7,22	7,29	6 A 9
CONDUCTIVIDAD ELÉCTRICA (µS/cm)					51,4	57,6	SR
ST (mg/L)	122	90	69	102	41	48	SR
FOSFORO TOTAL (mg/L)	0,13	0,055	0,09	0,1	0,045	0,040	0,025
NITRITO (mg/L)					0,034	0,037	1
NITRATO (mg/L)	0,72	0,05	0,25	0,18	0,51	0,526	10
DQO (mgO2/L)	20,4	17,5	21,1	21,8	9,02	10,53	SR
DB05 (mg02/L)					4,2	4,5	<3
NTK (mgN/L)					0,268	0,283	0,3

Where analysis has been carried out, some values are above the recommended levels (e.g. total phosphorus in the Tebicuary river)



SR= sin referencia en la Resolución 222/02 de la SEAM

Fuentes: 1 SEAM, 2ADIFCA, 2017

Recommendations

- Sustainable intensification of feedstock cultivation is needed, especially for sugarcane at small scale
- LUC should be reduced and possibly avoided
- **Regular monitoring of soil and water quality** in feedstock production areas should be guaranteed
- Issues of policies to incentivize industries that have sustainability certification to minimize the main environmental and social risks



2021 Project – Biodiesel from soybean

- Currently undertaking a rapid assessment of the biodiesel value chain from soy
- To determine the sustainability of the sector and where more information/data are required
- Stimulate the development of policies that promote its sustainable development
- Project results available September 2021



Thank you



GBEP-Secretariat@fao.org

http://www.globalbioenergy.org

