

Tracking Sustainable Bioenergy Development

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SUSTAINABILITY is key

**Bioenergy presents excellent OPPORTUNITIES
not without CHALLENGES.**

SUSTAINABILITY IS KEY to take out the best of opportunities.

The Global Bioenergy Partnership (GBEP)

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

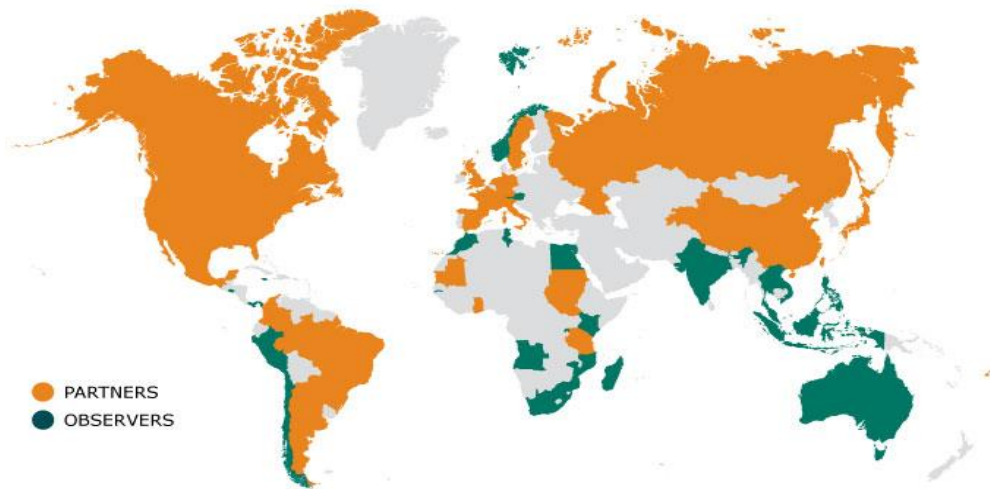
The Global Bioenergy Partnership (GBEP)

GBEP was established to implement the commitments taken by the **G8 in 2005** to **support “biomass and biofuels deployment**, particularly in developing countries where biomass use is prevalent”.

GBEP aims mainly to:

- Promote high-level **policy dialogue** on bioenergy and facilitate international **cooperation**;
- support national and regional bioenergy **policy-making** and **market development**;
- favour the transformation of biomass towards more efficient and **sustainable practices**; and
- foster **exchange** of **information**, **skills** and **technologies** through bilateral and multilateral **collaboration**.

The GBEP membership

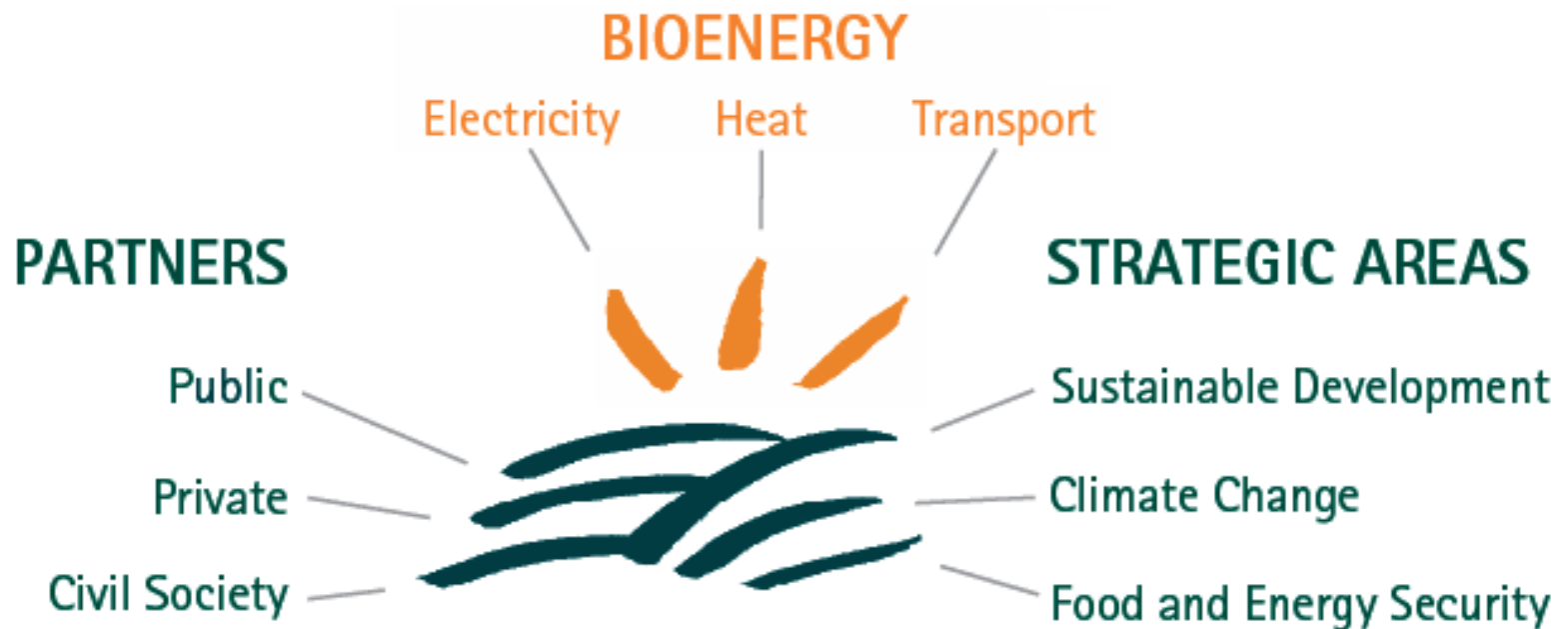


38 Partners and 41 Observers

(Governments and International Organizations)





The GBEP focus



Italy and **Brazil** are currently Chair and co-Chair of the Partnership.
The Secretariat is hosted at FAO in Rome.

GBEP sustainability indicators for all types of bioenergy

ENVIRONMENTAL		ECONOMIC
1. Lifecycle GHG emissions		Productivity
2. Soil quality		Net energy balance
3. Harvest levels of wood resources		Gross value added
4. Emissions of non-GHGs, including pollutants, including toxics		Change in consumption of fossil fuels and traditional use of biomass
5. Water use and efficiency		Training and re-qualification of the workforce
6. Water quality		Energy diversity
7. Biological diversity in landscape		Infrastructure and logistics for distribution of bioenergy
8. Land use and land-use change related to bioenergy feedstock production		Capacity and flexibility of use of bioenergy

Implementation of the sustainability indicators



GBEP Indicators implemented by FAO in COLOMBIA-INDONESIA-VIETNAM-PARAGUAY

Between 2011 and 2014, FAO tested the GBEP indicators in **Colombia and Indonesia**, while between May 2016 and April 2018 FAO implemented them in **Vietnam and Paraguay** with support from the International Climate Initiative (IKI) of the **Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of Germany**.

These projects were aimed to:

- **strengthen the capacity** of relevant national institutions and organizations to assess bioenergy sustainability via the GBEP indicators; and
- use the results of the measurement of the GBEP indicators **to inform bioenergy policy-making** (within the context of low-carbon development), setting the basis for a **long-term monitoring** of bioenergy sustainability

INDONESIA - biodiesel from palm oil

Amongst the key trends identified



- POME Methane Capture systems incidence only <10%, crucial for GHG profiles and for energy generation (biogas)



VIETNAM - biogas

Amongst the key trends identified

Overall, biogas may be an **effective option** to replace fossil fuels (e.g. coal) and other less efficient and less sustainable biofuels.

However, the following challenges were observed:

- **Anaerobic Digesters (ADs)** often **poorly managed**, reducing their benefits and giving rise to **negative impacts** e.g. oftentimes too much **water** is put into the ADs (reduced fermentation efficiency; difficulties in transporting digestate to the field for soil application); biogas leakages due to **cracks** in the ADs (biogas loss).
- **Inability and unaffordability to buy electricity generators**: at farm scale biogas is only partly used to cook and heat. Excess biogas – which is not used for electrification purposes – is **intentionally released (venting or flaring)**, resulting in **significant emissions** of **methane** (CH_4), which is a **GHG** with a high global warming potential.
- The **cost** of building ADs is still **high** and the **payback period** is **long**.

RECOMMENDATIONS:

- **Improved design** of ADs and **trainings for farmers** on their effective management
- **Promote power generation** from agricultural and livestock residues (including for biogas surplus) to ensure higher returns for investments in ADs and avoid GHG emissions from venting and flaring
- At household level, establishment of **micro-financing schemes** to support the installation of ADs



GBEP indicators used as a basis for the H2020 FORBIO project

FORBIO - Fostering Sustainable Feedstock Production for Advanced Biofuels
on "under-utilized land" in Europe (2016-2018)

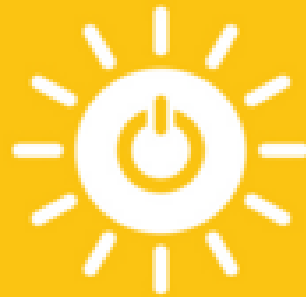
- Case study – **Germany** (two study areas Northeast Germany)
- Feedstocks - spontaneous grass, alfa-alfae and sorghum for the production of **biomethane**
- The sustainability analyses carried out in the context of FORBIO confirmed that biomethane ranks **among the most sustainable advanced biofuels available in the conditions tested** (e.g. underutilized and contaminated lands).
- Biomethane production, as studied in FORBIO, is **particularly advantageous from a GHG LCA** point of view. In fact, if we do not consider **leakages**, the production of this energy carrier would save 84.05% of the emissions produced by natural gas (8.93 gCO₂eq/MJ vs 56 gCO₂eq/MJ). However it should be noted that biogas systems rarely have zero leakage, as confirmed by many authors. Comparable biomethane plants have a leakage of at least 1.1% of total biomethane produced. Being CH₄ an extremely powerful GHG (25 times higher Global Warming Potential than carbon dioxide), the total emission increases from 8.93 gCO₂eq/MJ to 46.47 gCO₂eq/MJ when leaking is factored into the analysis, making the biofuel 17% less carbon intense than natural gas.
- Main bottleneck identified - GHG emission savings of the biomethane technology - It is fundamental that **state-of-the-art construction technologies and equipment** are employed in future plants in order to reduce the more the possible leakage phenomena.

SDGs relevant for bioenergy

2 ZERO HUNGER



7 AFFORDABLE AND CLEAN ENERGY



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



7 AFFORDABLE AND CLEAN ENERGY



13 CLIMATE ACTION



13 CLIMATE ACTION



10 REDUCED

15 LIFE ON LAND



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



SUSTAINABLE
DEVELOPMENT
GOALS

Bioenergy contributing to NDCs

- Countries' pledged contributions to global emission reduction are set out in their Nationally Determined Contributions (NDCs).
- In terms of **mitigation** - countries would identify bioenergy options to achieve their mitigation targets, based on specific pathways.
- In terms of **adaptation** – countries would define the energy requirements and sources of energy to support their adaptation strategies as planned within their NDCs.
- Not all countries include actions to reduce emissions from energy in their NDCs. FAO can support countries to define what energy related emissions can be mitigated or need to be adapted in the agriculture sector.

Conclusions

- Bioenergy and biogas have the potential to reduce GHG emissions **and offer opportunities to agriculture and forestry sectors**
- **Sustainability** is key
- **Monitoring sustainability** is a **necessary step** in order to understand, evaluate and improve the performances of the sector
- **GBEP is actively working** on the diffusion of **sustainability** in the processes of production and use of bioenergy resources with several activities and tools, including the **GBEP Sustainability Indicators for Bioenergy**
- Particularly for **policymakers**, GBEP represents an important forum for discussion and harmonization of **policies**

Thank you



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<http://www.globalbioenergy.org>



VIETNAM – the biogas sector

Today the main feedstock is **animal manure**:

- 27 Million pigs and 5.2 million cattle (buffalo, cows) for a potential of **2,445 Million m³ biogas**;
- about **500,000** small size (**<10 m³**) biogas tanks. 300,000 of these **replace coal** in flat rural areas and **200,000 replace wood** in mountainous areas. Biogas used mainly at household level for **cooking and lighting purposes**. Average cost is **200 USD/tank**
- **100 biogas tanks** with medium scale capacity of about 100-200 m³;
- **10 large scale** biogas production plant (from 300 up to 19000 m³). Biogas used at large scale mainly for power generation, fuel for generators, heating production (dry feedstock, seeds)

Huge potential for future sector development:

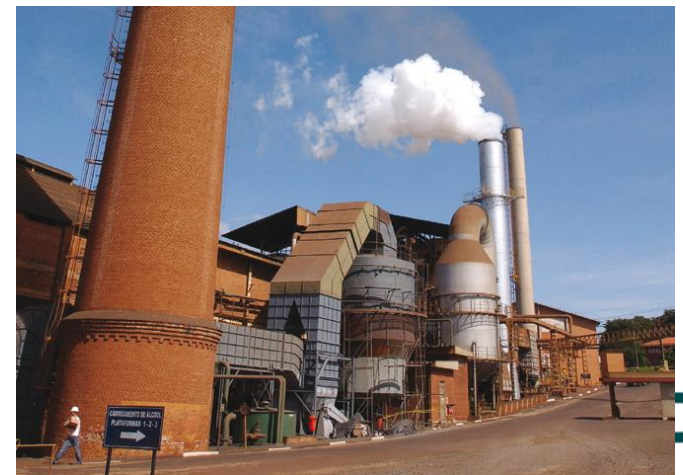
- only the 0.3% of 17,000 large scale pig farms (with more than 500 pigs per farm) currently has a biogas plant;
- Large amount of organic waste suitable as raw materials for biogas production:
 - 27.1 Million tons of **wood waste** (wood, sawdust);
 - 56.2 Million tons of **agricultural waste**;
 - 43 Million tons of **household/municipal waste**.

COLOMBIA - bioethanol from sugarcane

Amongst the key trends identified

Sugarcane-based ethanol:

- **Decrease in sugar exports**, with **domestic supply** of sugar for food substantially **stable**
- Relatively **low expansion in sugarcane area**
- Minimal impact on employment, but good conditions
- **Good GHG emission profile**
- Potential pressure on water resources and susceptibility to soil salinization



PARAGUAY - solid biomass for energy

Amongst the key trends identified

Despite 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 rely on traditional energy (e.g. open fire) for cooking and heating.**

- The supply of wood from sustainable production is not sufficient to cover its current demand at the household and industrial levels, showing a negative balance of approximately 7.5-11 million tonnes per year.

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

• RECOMMENDATIONS

- Incentivise the **sustainable management of productive native forests**, for example, through the adoption of dedicated policies.
- **Maximise control** over, and sanction of, deforestation and of the illegal trade of forest products and by-products; and
- Guarantee the **traceability** of biomass products and by-products (e.g. charcoal).