

# SUSTAINABLE BIOENERGY

LATIN AMERICA AND AFRICA





BIOEN BIOTA PFP MCG SEI ICRAF SCOPE

**Argentina Australia Belgium Brazil Canada Colombia Costa Rica Denmark Egypt  
France Germany Ghana India Israel Italy Japan Kenya Malaysia Mauritius  
Mozambique Norway Portugal South Africa Sweden Switzerland Thailand The  
Netherlands UK Uruguay USA Zambia**

# SCOPE Bioenergy & Sustainability

A global assessment of Bioenergy & Sustainability  
154 experts from 31 countries

## Scientific assessments

<http://bioenfapesp.org/scopebioenergy>

BIOEN YouTube Channel



### BIOENERGY AND SUSTAINABILITY

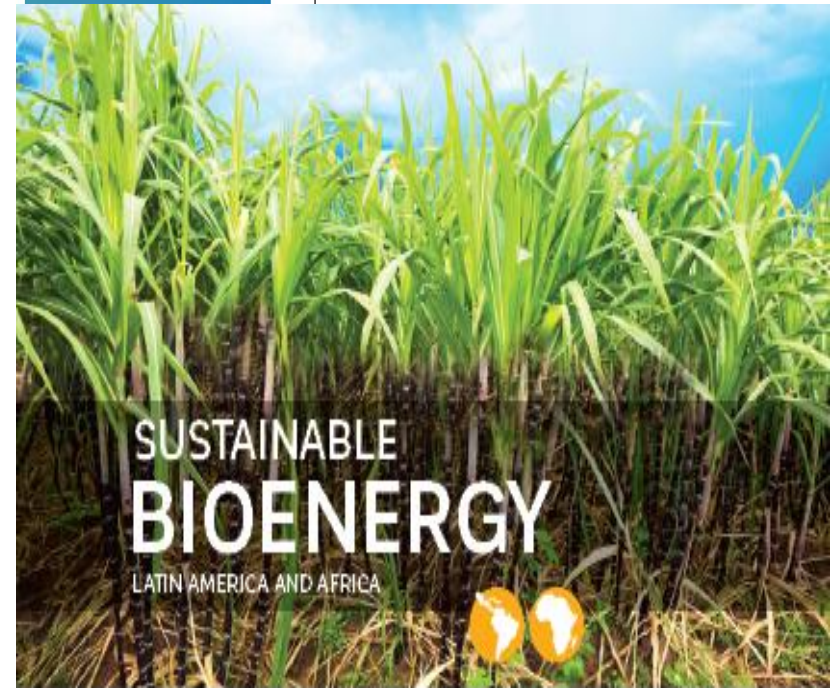
**Bioenergy**, a renewable energy source, has the potential to move the planet into a more sustainable future. Today fossil fuels supply almost 82% of the world's energy demand. The resulting green house gas emissions (GHG) impact Earth's systems and human health and wellbeing.

Currently bioenergy contributes approximately 10% of the world's primary energy supply. Bioethanol and biodiesel provide about 3% of the world's transportation fuels, but biofuels could provide up to 30 % by 2050 with projected improvements in technology. Bioenergy - developed knowledgeably and implemented considering local and regional needs - can help:

- increase resilience in food supply both locally and globally
- decrease pollution
- preserve biodiversity
- improve human health
- rehabilitate degraded land
- mitigate climate change
- provide economic and business opportunities

# Bioenergy & Sustainability: bridging the gaps

EDITED BY  
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# THE GLOBAL GOALS

For Sustainable Development



**Bioenergy can play a critical role in supporting sustainable development**

# Nations Unies Conférence sur les Changements Climatiques

COP21/CMP11

## Paris, France



**Bioenergy is critical to secure a renewable energy matrix**

# Conclusions

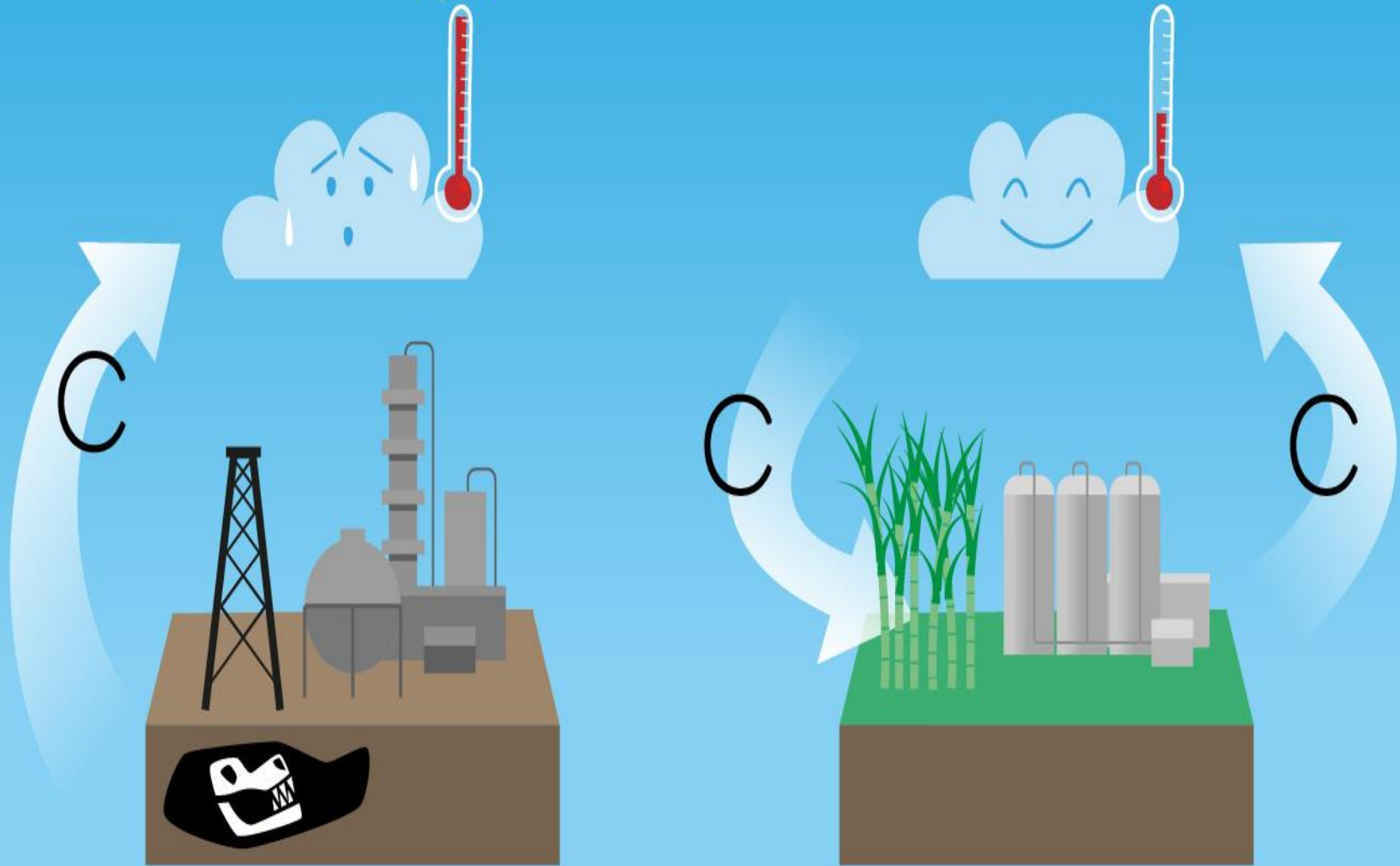
- Bioenergy can play a critical role in supporting sustainable development
- Bioenergy is critical to secure a renewable energy matrix
- Energy from hydro, solar and wind can provide electricity but bioenergy unique characteristics make it an especially interesting option
- Bioenergy has large scalability and sustainability potential  
Producing bioenergy locally can harness growth of the agricultural sector for broader rural development
- Bioenergy expansion does not have to be made at the expense of food security and biodiversity
- It is possible to combine forest preservation/recovery and feedstock production for bioenergy
- The bioenergy business is an opportunity for innovation
- International cooperation can drive the bioeconomy

# Energy from hydro, solar and wind can provide electricity but bioenergy unique characteristics make it an especially interesting option

- Biomass can be stored to produce continuous rather than intermittent energy, making it easier to use and to integrate into unreliable power grids.
- Bioenergy uses locally available resources.
- Bioenergy can provide fuels that fit in the present infrastructure.
- Bioenergy comes in many forms such as gas, solid, liquid, heat and electricity, providing versatility for various applications.
- The high energy density of ethanol (around 70% of gasoline) highlights its potential to be used in transportation, **helping secure a fast transition to a renewable energy matrix alongside solar and wind energy that still lack efficient energy storage systems.**

## Bioenergy has large scalability and sustainability potential

The Brazilian ethanol production by 2045 could displace up to 13.7% of crude oil consumption and 5.6% of the world's CO<sub>2</sub> emissions relative to 2014



Currently, bioethanol and biodiesel provide about 3% of the world's transportation fuels

Biofuels could provide up to 30% by 2060 with projected improvements in technology



Total land area (km<sup>2</sup>)

19,197,000

“Spare & usable” marginal land (km<sup>2</sup>)

3,600,000

Total population in 2015 640 million  
in 2050 780 million



% undernourished

2014-2016 <5

GDP in 2014 in trillion

US\$ 5.6

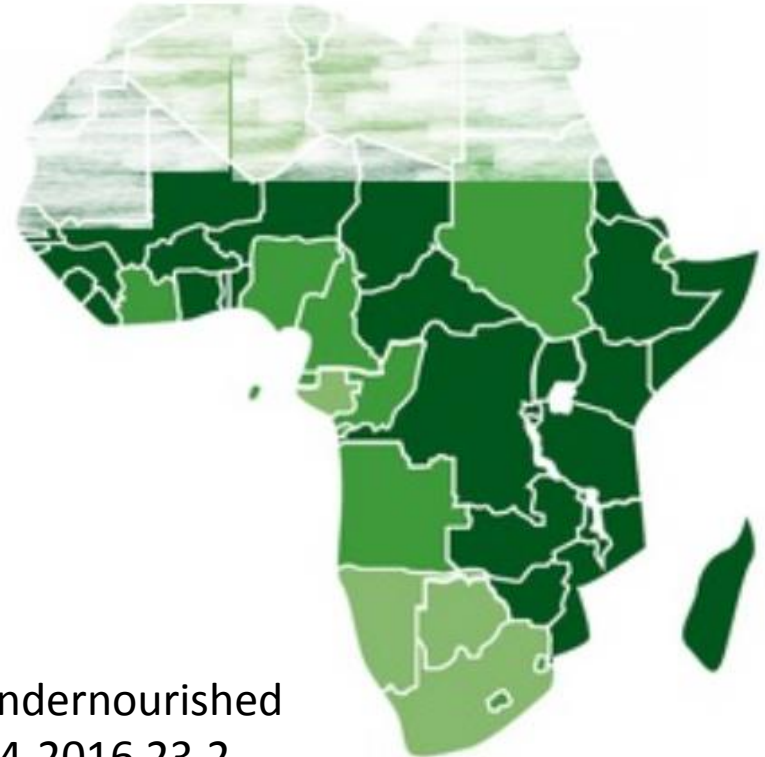
Total land area (km<sup>2</sup>)

19,529,768

“Spare & usable” marginal land (km<sup>2</sup>)

4,500,000

Total population in 2015 1.1 billion  
in 2050 2.2 billion



% undernourished

2014-2016 23.2

GDP in 2014 in trillion

US\$ 1.6

Without compromising food security or biodiversity Sub-Saharan Africa and Latin America have an estimated 500 to 900 million hectares of land available for bioenergy

Latin America currently produces more food than it needs and exports food products to the rest of the world

# Total global land is 13 Billion Hectares

Area needed for modern bioenergy expansion  
25% of the global energy matrix by 2050  
50 to 200 Mha  
Spain = 50 Mha

Crops and arable land  
1.5 Bha  
<Russia = 1,700 Mha

Bioenergy  
10-60 Mha  
UK + Ireland +  
Iceland = 41 Mha

Pastures  
3400 Mha  
Canada + USA + Mexico + Peru  
+ Brazil + Argentina = 3.4 Bha

Liquid biofuels  
<13 Mha  
Nicaragua = 13 Mha

Conventional Ethanol  
83 Billion L  
3.1 EJ  
6.8 Million Ha of land

Biodiesel  
23 Million tonne  
1.1 EJ  
6.3 Million Ha of land

HVO  
6 Million tonne  
0.1 EJ  
<0.1 Million Ha of land

Planted  
Forests  
100 Mha  
Bolivia = 0.1  
Bha

Forests  
3 Bha

Urban areas  
100 Mha  
Egypt = 0.1  
Bha

Others  
3800 Mha  
Africa + Australia = 3.9 Bha

# **The bioenergy business is an opportunity for rural development**

The vast majority of poor people in Africa and Latin America dependent on agriculture for their livelihoods

Producing bioenergy locally can harness growth of the agricultural sector for broader rural development.

# Bioenergy expansion does not have to be made at the expense of food security and biodiversity

- Forests store 18 times more carbon than sugarcane and the combination of both, plus the expected increases in productivity due to technology improvement, could keep ethanol production along with the benefits of sustainable use of biodiversity.
- It is possible to combine forest preservation/recovery and feedstock production for bioenergy.

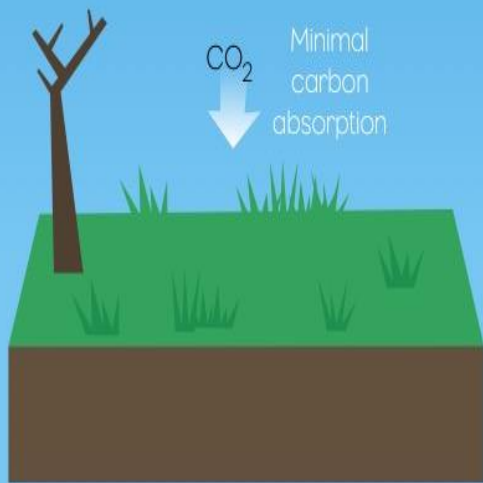
In Sub-Saharan Africa agriculture stagnant yields since the 1970s.

In Latin America, agricultural lands in some areas are very likely to be subjected to desertification and salinization by 2050

Bioenergy crops can help stop land degradation or even restore depleted soils.

Bioenergy can help create new markets for residues.

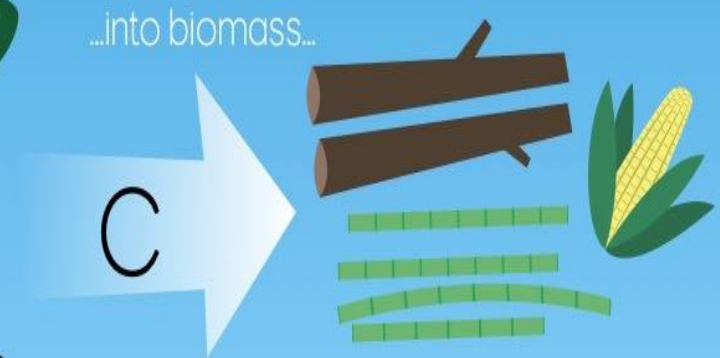
Carbon goes from the atmosphere...  
Creating markets for agricultural waste products can add to farmers' earning potential.



Transform this



into this



...and into the ground.

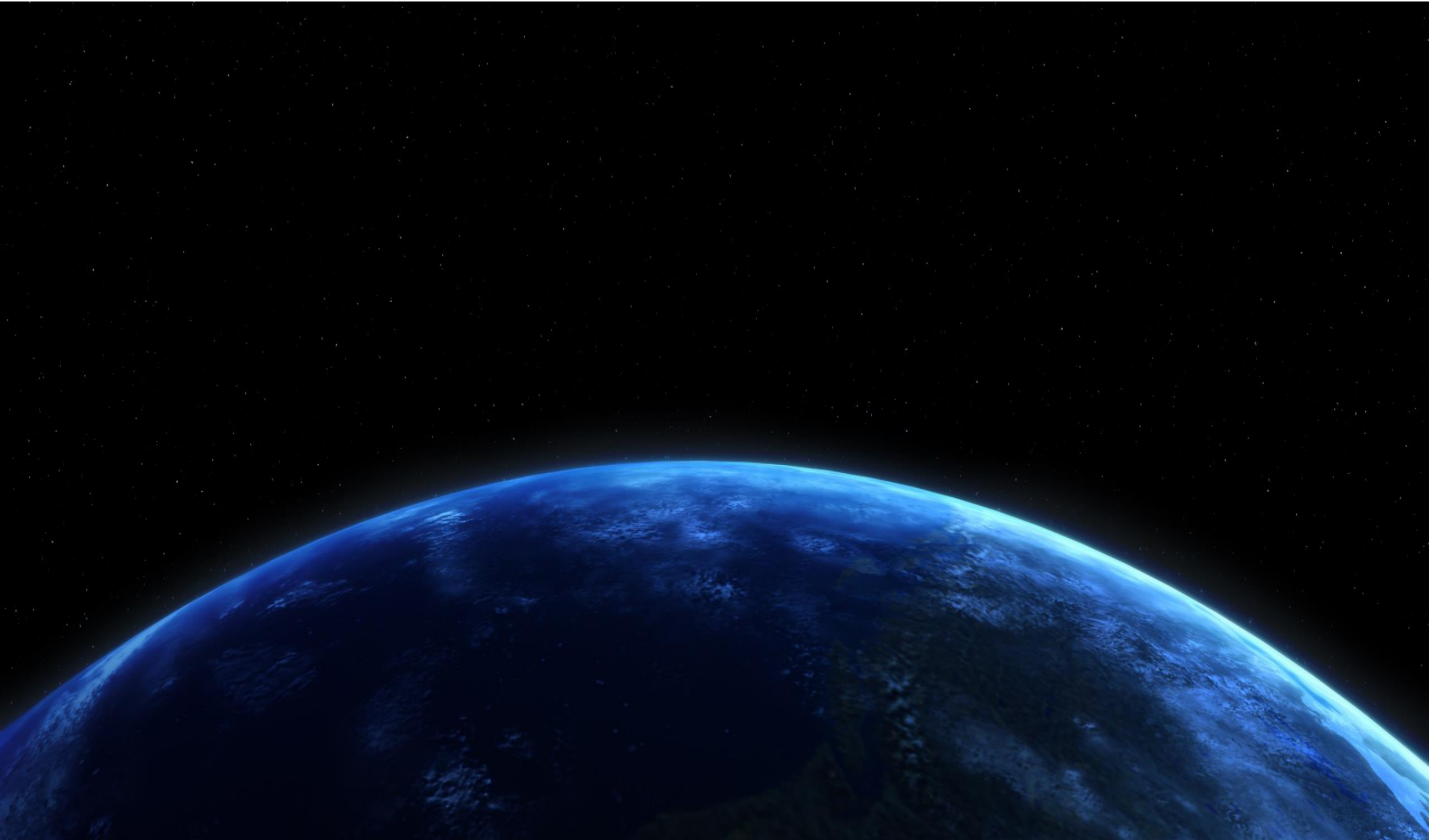
reducing global GHG emissions by 50-70% by

# **The bioenergy business is an opportunity for Innovation**

- Technological advancements such as systems to reduce emissions and improve water use efficiency
- Organizational advancements such as changes in institutional behavior and green financing
- Social advancements due to job creation, improved capacity building, better paid jobs

**Among all renewable energy sources, bioenergy is by far the one with potential to create more jobs in Latin America and Africa**

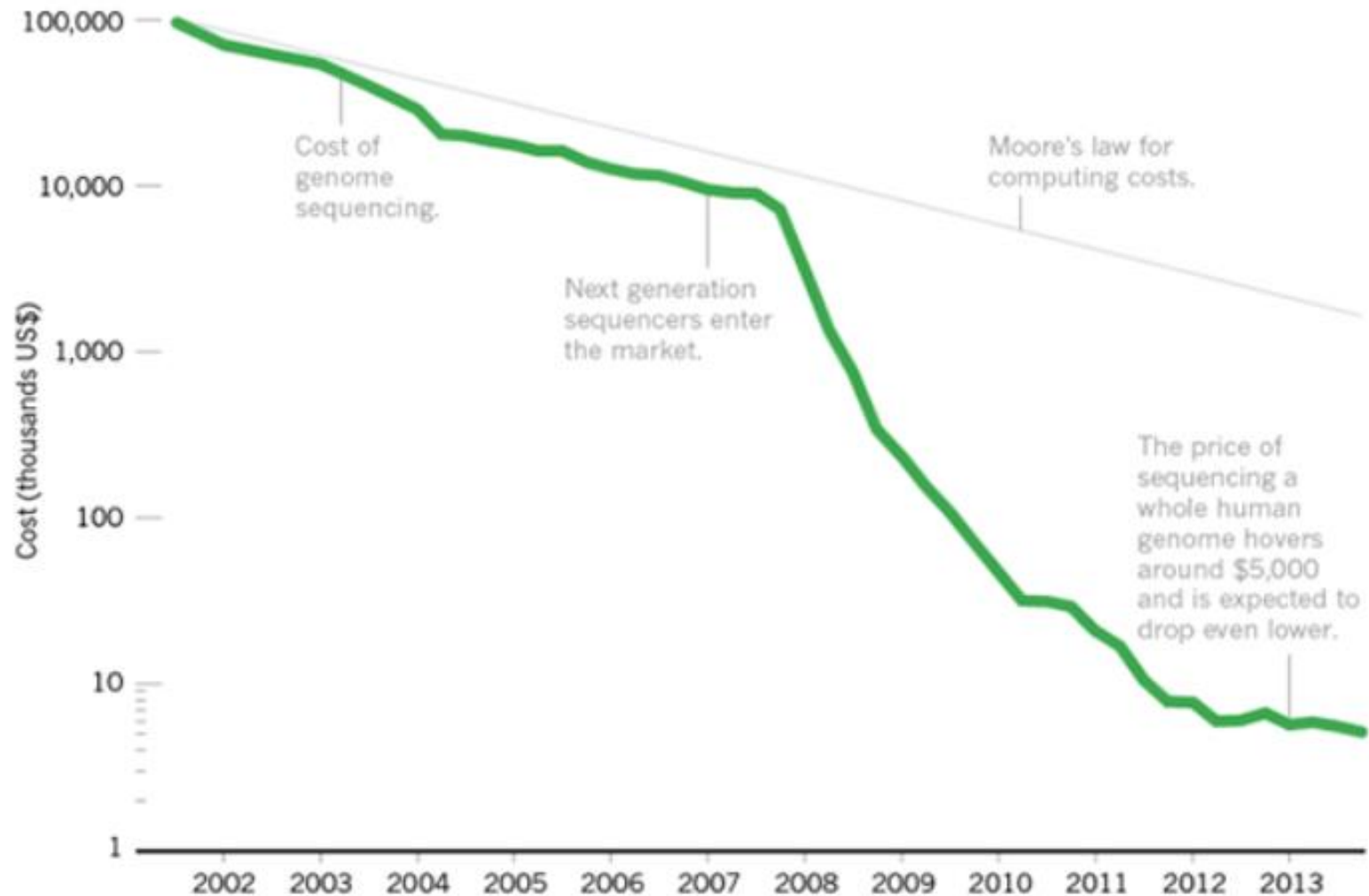
**What kind of jobs?**  
**Tech for Sustainable Development**  
**Synthetic Biology + 4.0 Industry**





# Falling fast

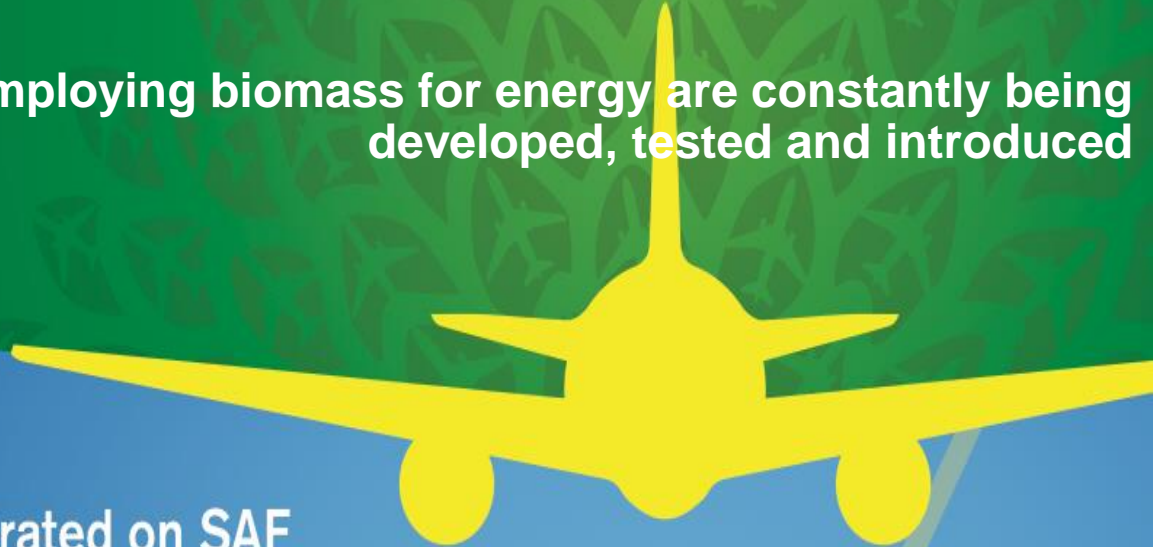
In the first few years after the end of the Human Genome Project, the cost of genome sequencing roughly followed Moore's law, which predicts exponential declines in computing costs. After 2007, sequencing costs dropped precipitously.



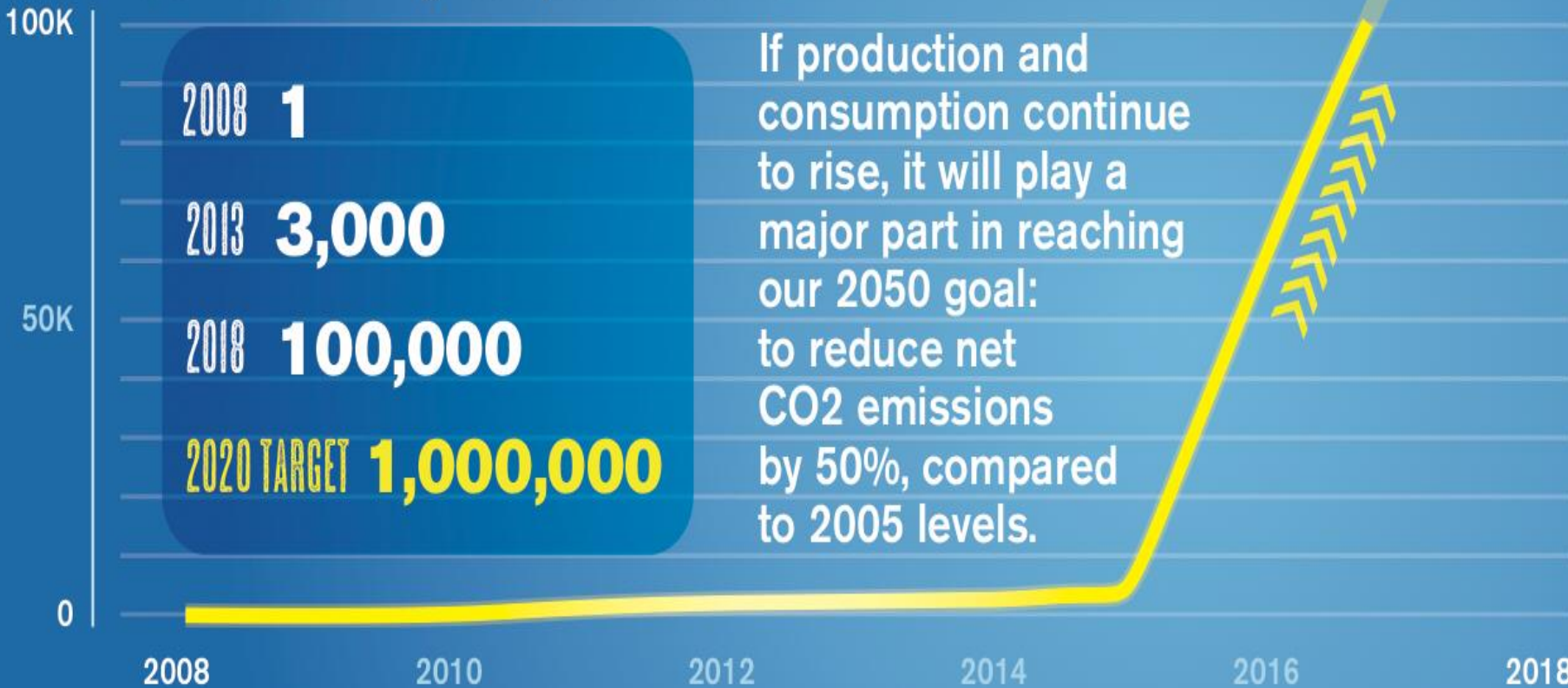
Cost of DNA sequencing per million bases. (image from Nature.com)

New technologies or systems employing biomass for energy are constantly being developed, tested and introduced

WE'VE COME A LONG WAY SINCE THE FIRST TEST FLIGHT IN 2008



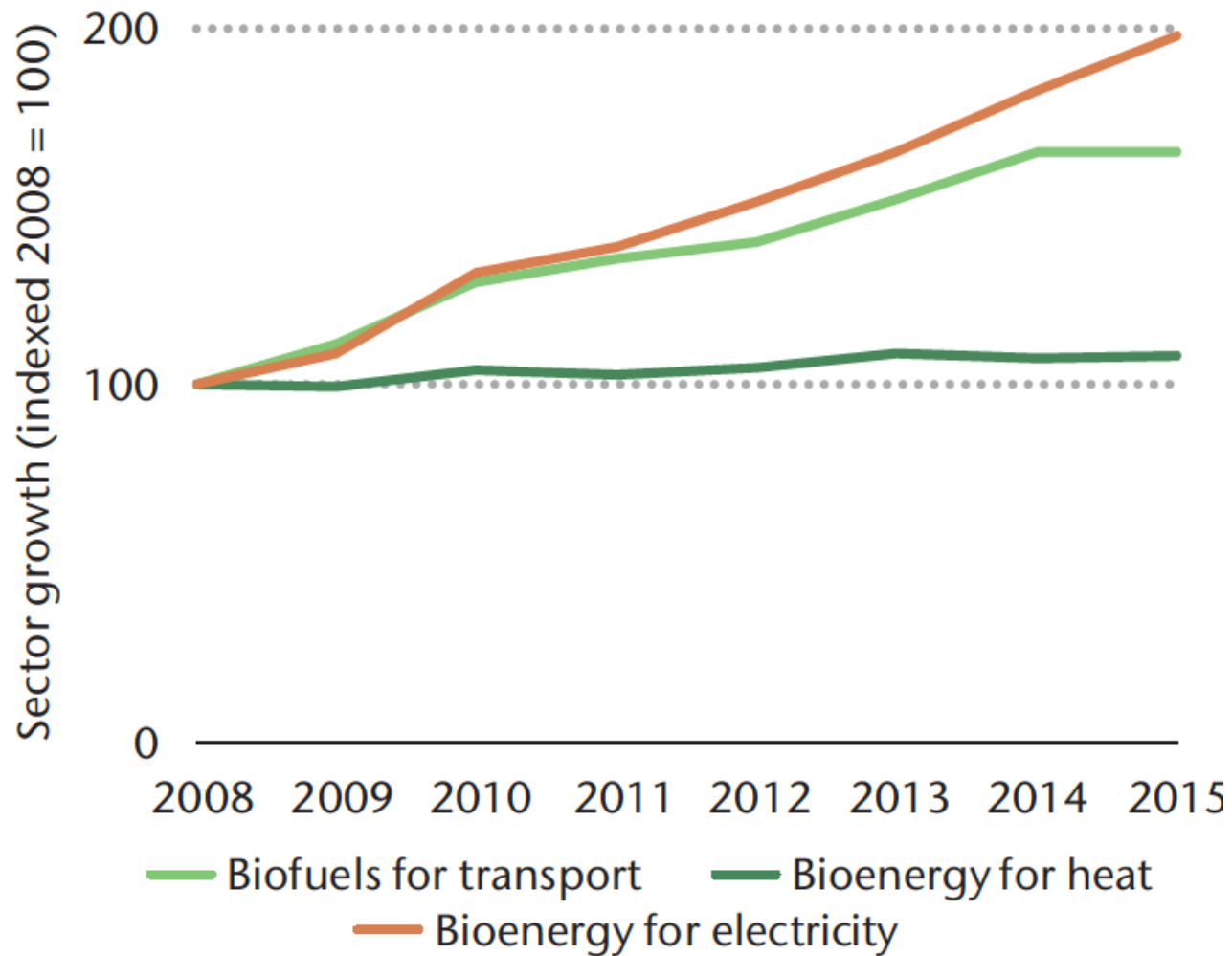
### Commercial flights operated on SAF



If production and consumption continue to rise, it will play a major part in reaching our 2050 goal: to reduce net CO2 emissions by 50%, compared to 2005 levels.

IATA 2016: 5.5 billion liters of Sustainable Aviation Fuels in forward purchase agreements by airlines

## Modern bioenergy growth by sector 2008-2015

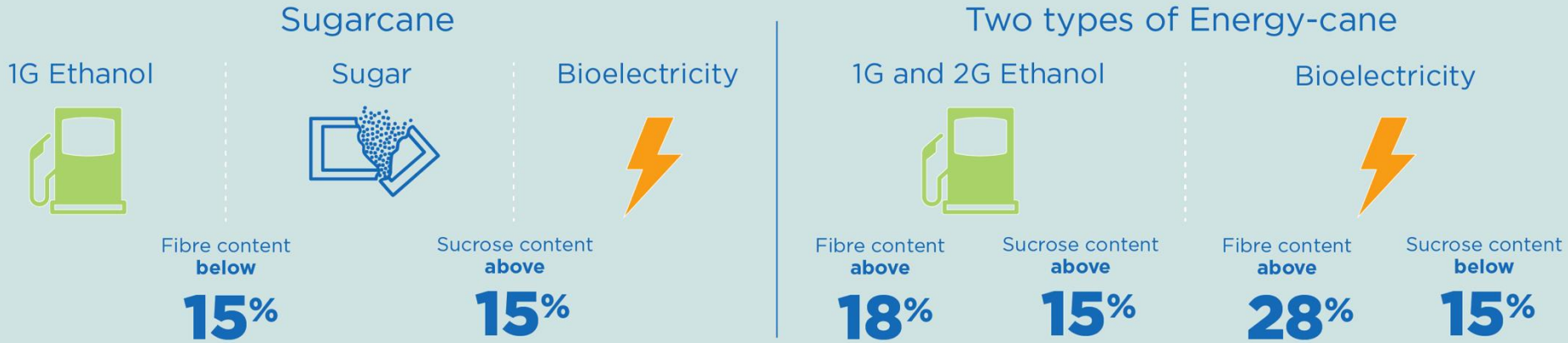


SOURCE:

**Technology Roadmap: Delivering Sustainable Bioenergy.** IEA, 2017, p. 14.

<https://webstore.iea.org/technology-roadmap-delivering-sustainable-bioenergy>

# SUGARCANE AND ENERGY-CANE



Energy Cane and Common Cane

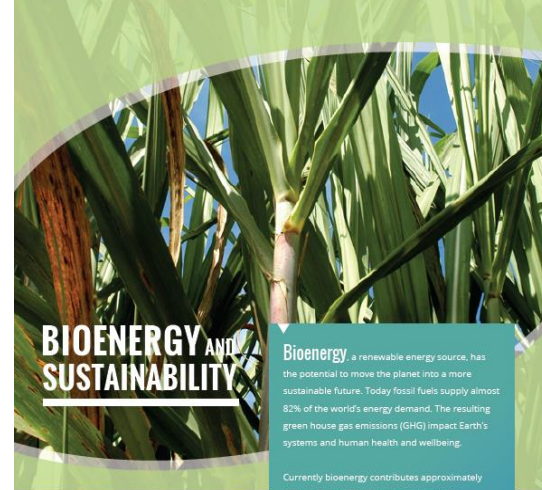
# International cooperation can drive the bioeconomy

- Bioenergy holds promise for international cooperation including monitoring and assessing projects:
  - improving both short and long-term data collection and reporting of lessons learned
  - creating a set of best practices that can be applied across projects
  - creating market-based incentives for resource and infrastructure development
  - linking efforts of global organizations with similar goals on bioenergy and biomass resources

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