Global Bioenergy Partnership (GBEP)

WORKING TOGETHER FOR SUSTAINABLE DEVELOPMENT

ECOWAS/GBEP Workshop on the

Piloting of GBEP Sustainability Indicators

Praia, 7-8 November 2013

Marco Colangeli
Programme Adviser
Global Bioenergy Partnership (GBEP)

GBEP
Global Bioenergy Partnership

Bioenergy & Sustainability

Sustain a system for an indefinite amount of time

Population size

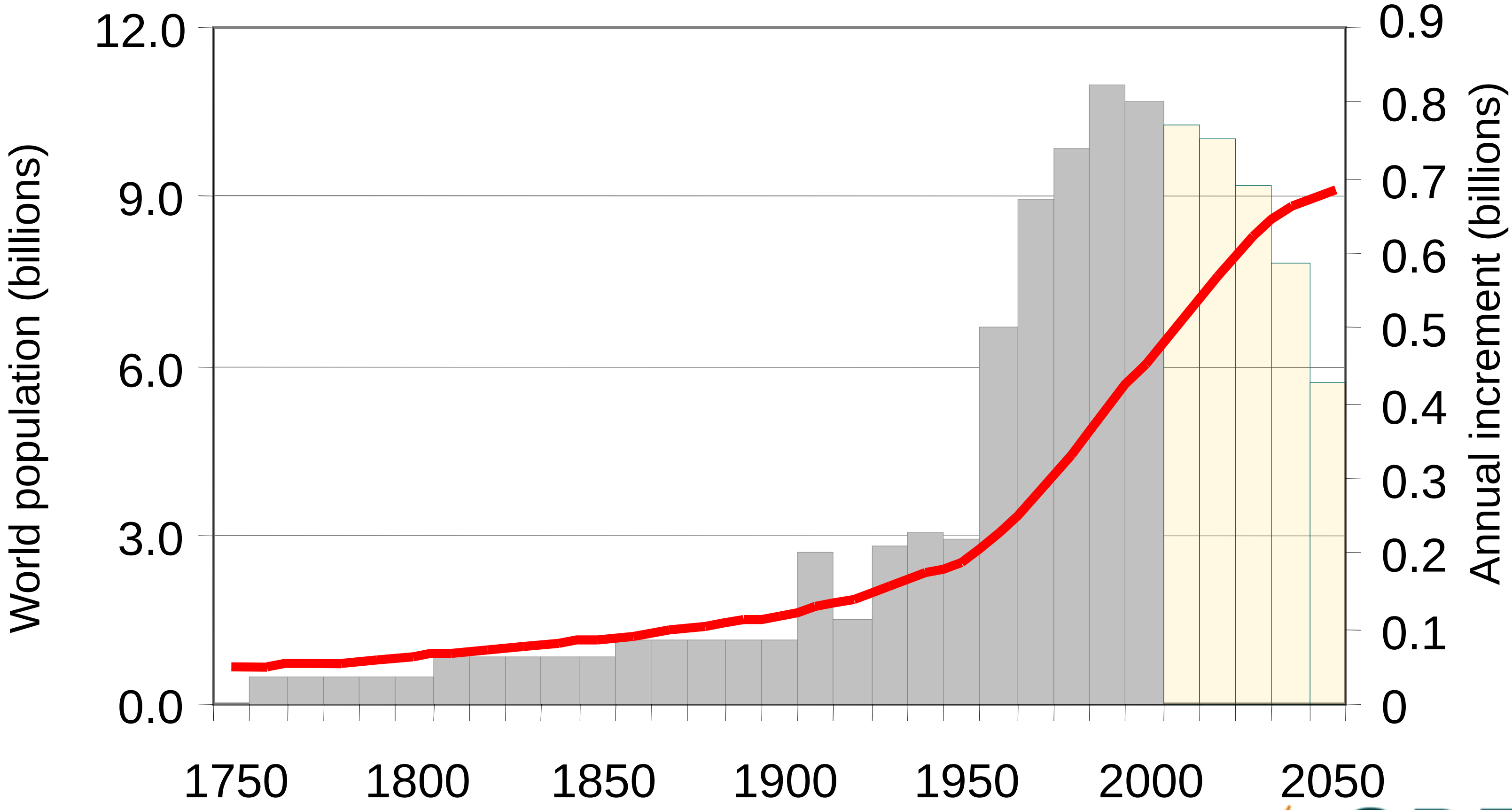
Affluence to resources

Technology factor

Impact = f P, A, T **(Paul R. Ehrlich, 1972)**

Global Bioenergy Partnership

World Population 1750 – 2050



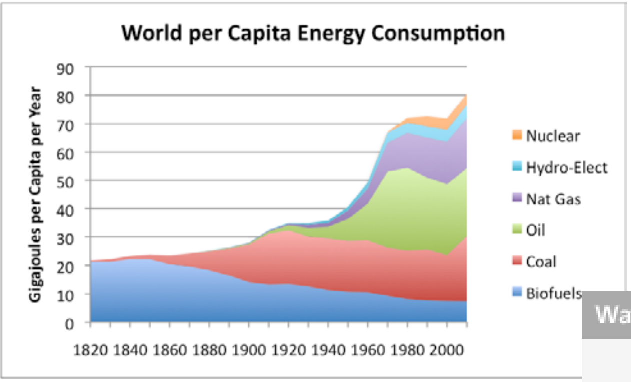
Source: UN, 2003

GBEP Global Bioenergy Partnership

Affluence to resources

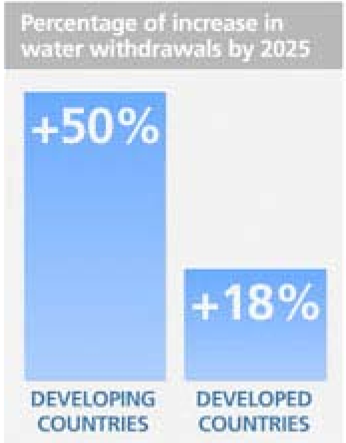
Resources consumption has been increasing steadily

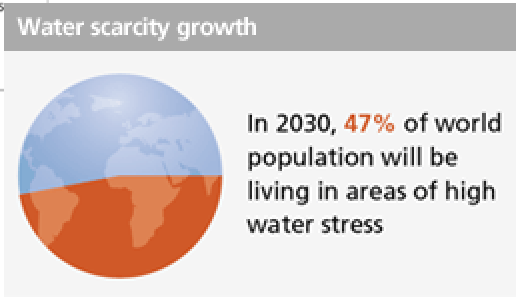
Per capita energy consumption



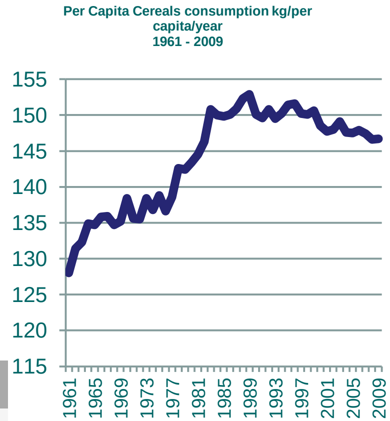
Edited from Maddison, 2005.

Per capita water consumption

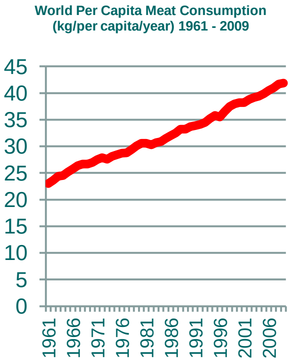




Per capita grain consumption



Per capita meat consumption

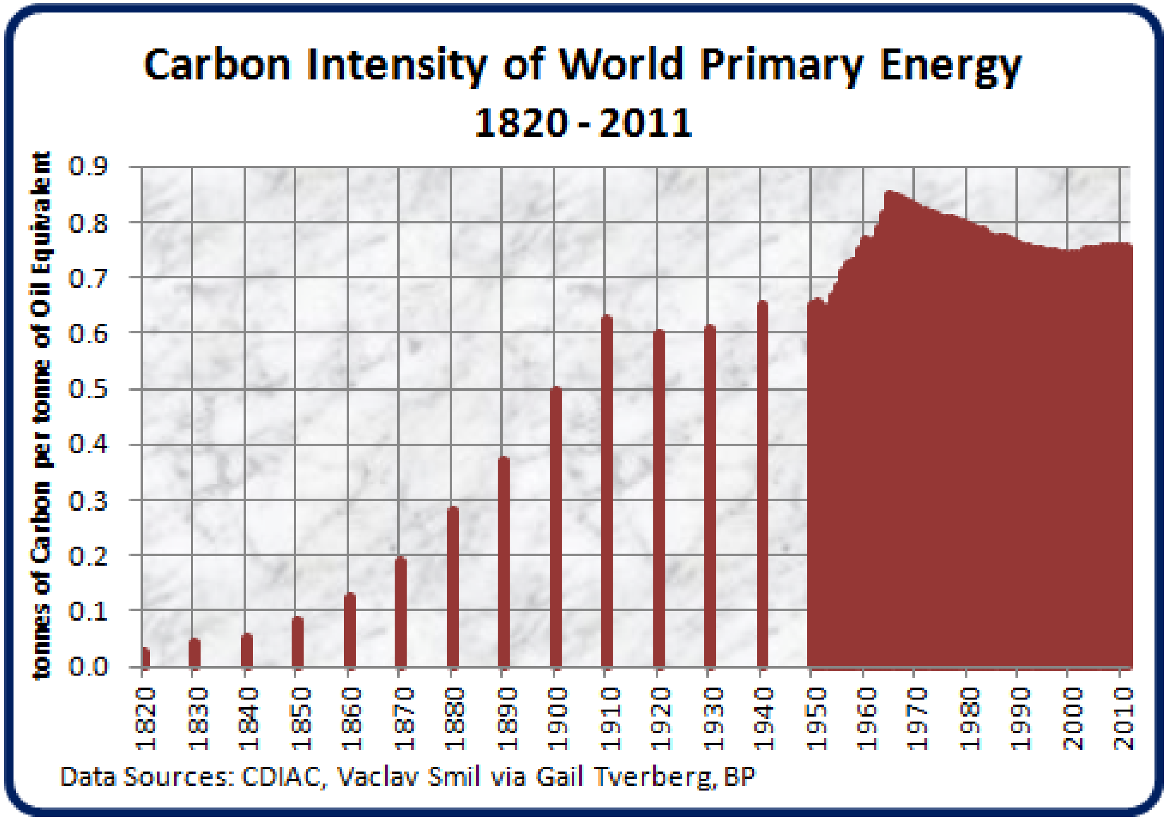


GBEP
Global Bioenergy Partnership

Technology factor

Emission intensity

gCO_2e/MJ

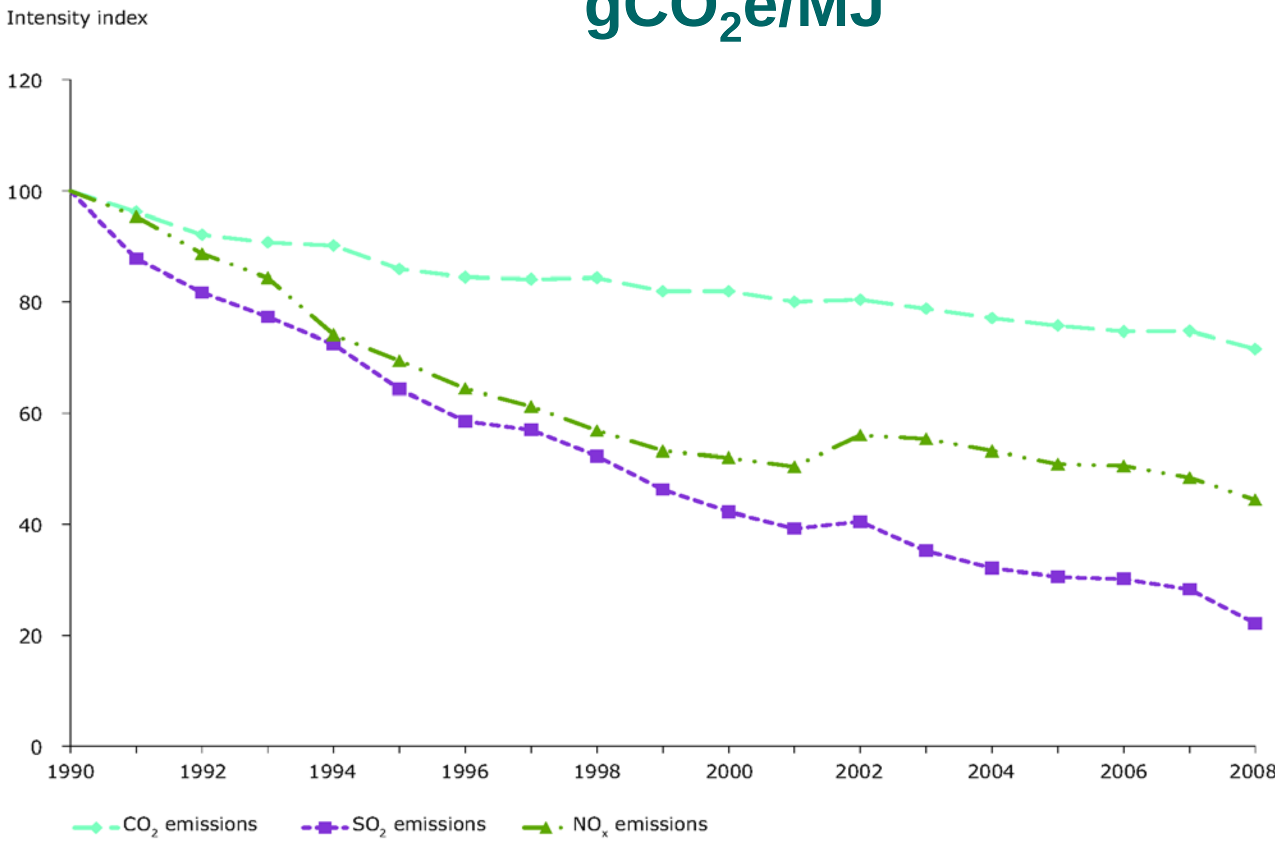


GBEP
Global Bioenergy Partnership

Technology factor

Emission intensity

gCO_2e/MJ

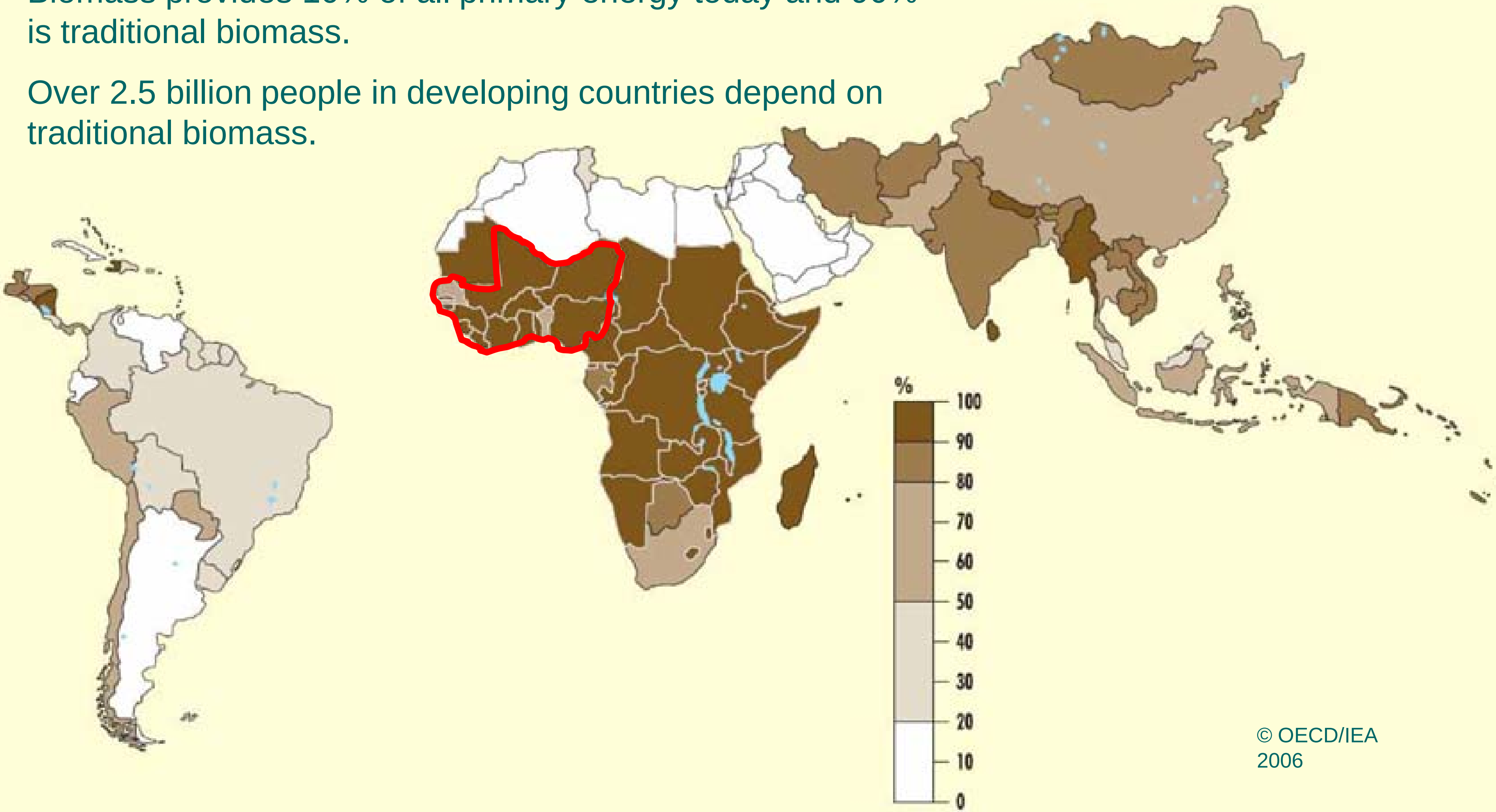


Global Bioenergy Partnership

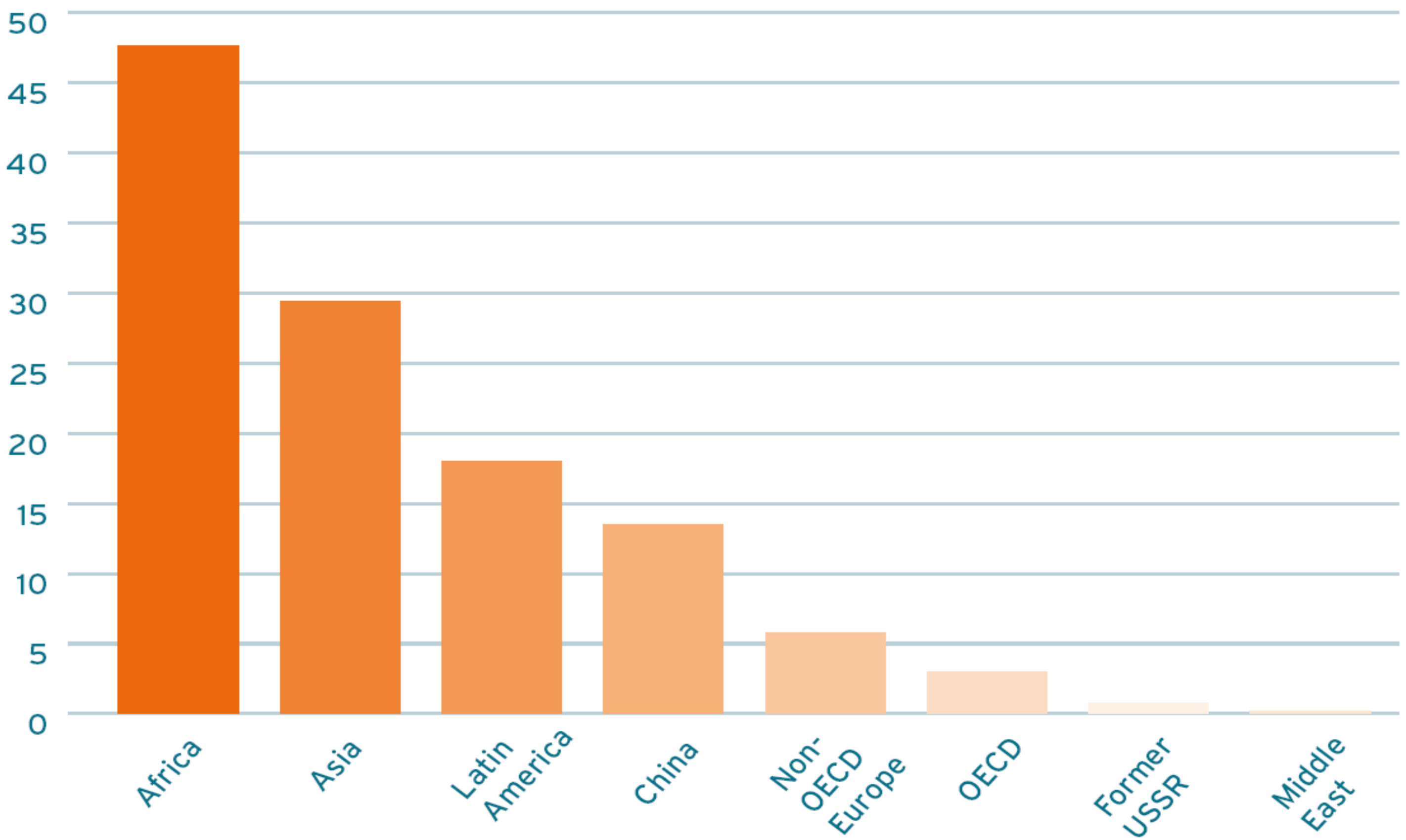
Bioenergy: actual and potential role

Biomass provides 10% of all primary energy today and 90% is traditional biomass.

Over 2.5 billion people in developing countries depend on traditional biomass.

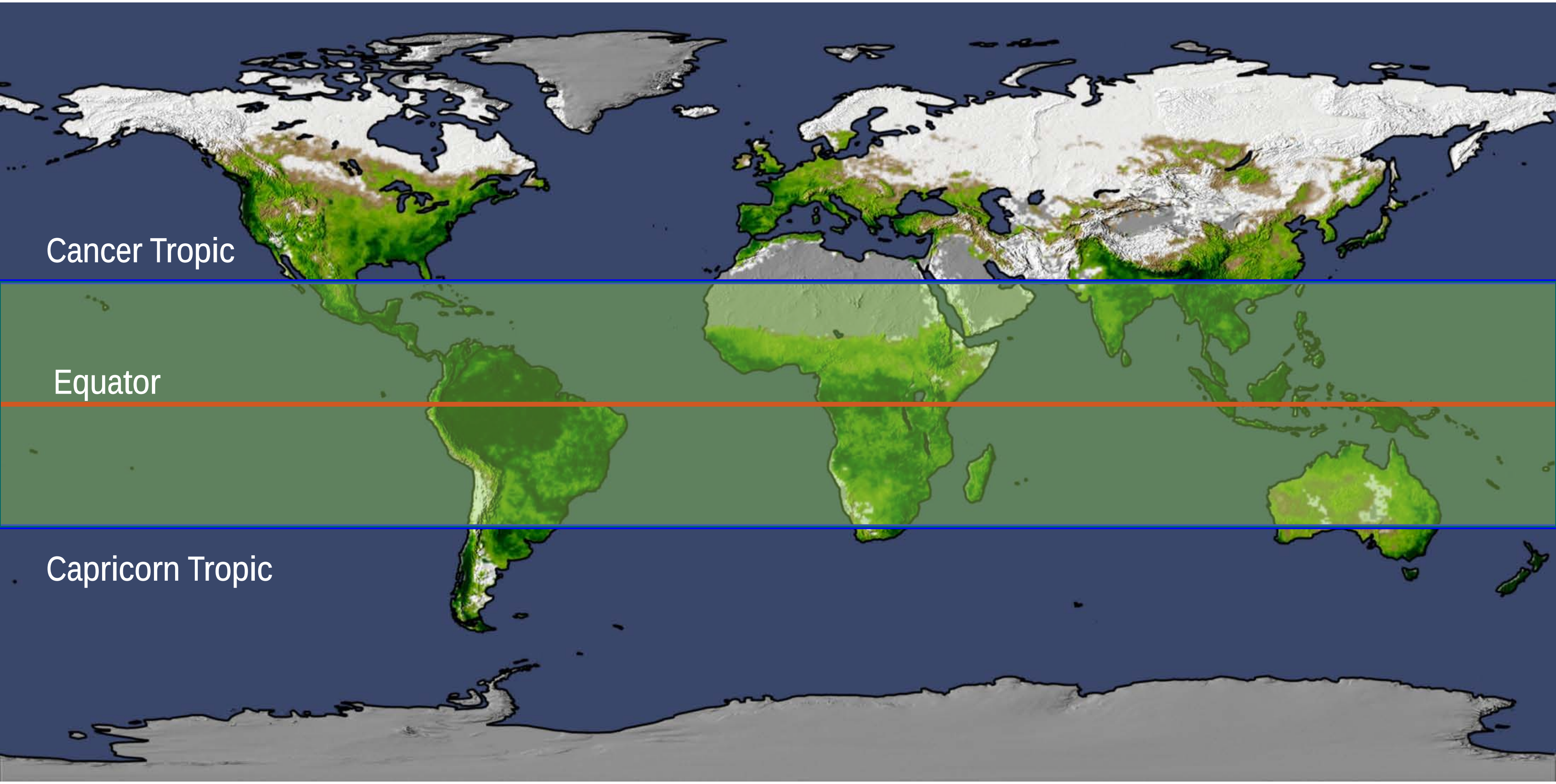


Share of bioenergy in total energy supply by region in 2004 (in %)



Global Bioenergy Partnership

The tropics have the highest NPP* potential



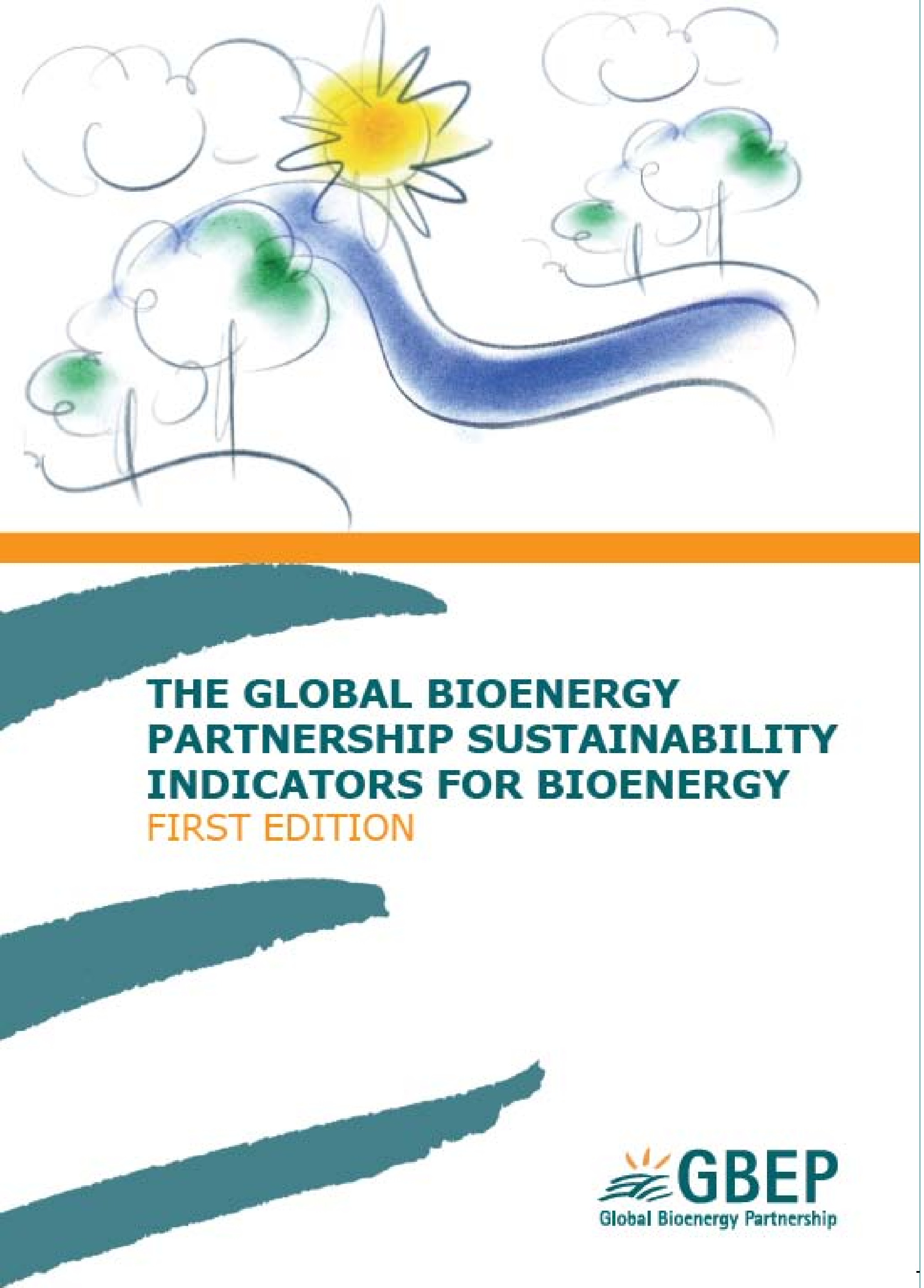
Map: NASA, 2013

GBEP Global Bioenergy Partnership

NPP* = Net Primary Production

Opportunities & Challenges

- Climate Change Mitigation
- Energy Flexibility
- Natural Resource Management
- Biodiversity Conservation
- Energy Access and Security
- Rural Development
- Food Security



Download from:

www.globalbioenergy.org

24 SUSTAINABILITY INDICATORS

agreed by 23 countries & 14 international organizations

involving a total of 49 countries and 25 int. organizations (Ps & Os)

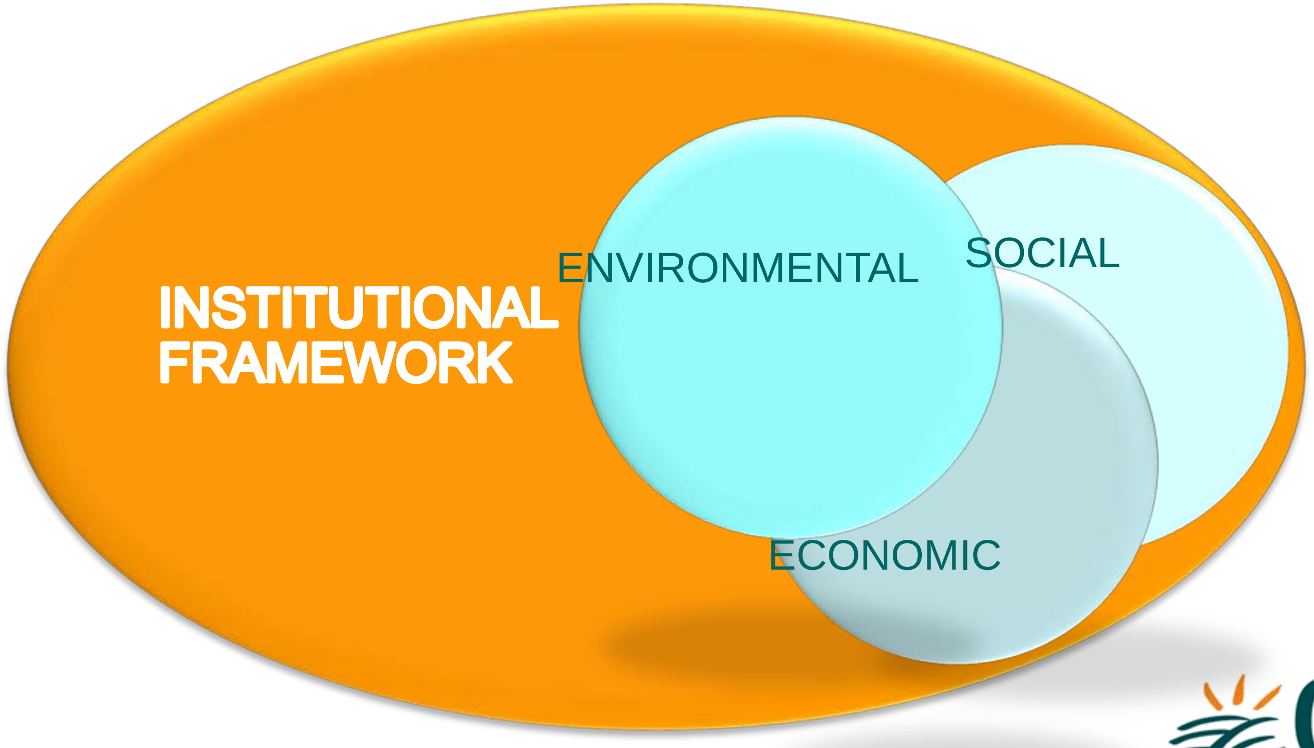
PILLARS		
Environmental	**Social**	**Economic**
INDICATORS		
1. Life-cycle GHG emissions	9. Allocation and tenure of land for new bioenergy production	17. Productivity
2. Soil quality	10. Price and supply of a national food basket	18. Net energy balance
3. Harvest levels of wood resources	11. Change in income	19. Gross value added
4. Emissions of non-GHG air pollutants, including air toxics	12. Jobs in the bioenergy sector	20. Change in consumption of fossil fuels and traditional use of biomass
5. Water use and efficiency	13. Change in unpaid time spent by women and children collecting biomass	21. Training and re-qualification of the workforce
6. Water quality	14. Bioenergy used to expand access to modern energy services	22. Energy diversity
7. Biological diversity in the landscape	15. Change in mortality and burden of disease attributable to indoor smoke	23. Infrastructure and logistics for distribution of bioenergy
8. Land use and land-use change related to bioenergy feedstock production	16. Incidence of occupational injury, illness and fatalities	24. Capacity and flexibility of use of bioenergy

GBEP Global Bioenergy Partnership

INSTITUTIONAL ELEMENT

In order to enrich interpretation of the GBEP indicators, information on legal, policy and institutional frameworks is extremely important:

- National policy objectives and targets provide useful context.
- Level of government support for bioenergy production and/or use useful in order to perform a cost-benefit analysis of a national bioenergy programme.



GBEP Global Bioenergy Partnership

WHAT MAKES THIS WORK UNIQUE

The uniqueness of the GBEP Sustainability Indicators lies in the fact that :

- It is the only initiative seeking to **build consensus among a broad range of national governments and international institutions on the sustainability of bioenergy;**
- The emphasis is on providing **science-based measurements useful for informing national-level policy analysis and development**;
- **It doesn’t have directions, thresholds or limits and does not constitute a standard; nor is it legally binding on GBEP Partners in any way.**
- It addresses **all forms of bioenergy**.

GBEP
Global Bioenergy Partnership

Structure of an Indicator

Indicator 2 Soil quality

Description:

Percentage of land for which soil quality, in particular in terms of soil organic carbon, is maintained or improved out of total land on which bioenergy feedstock is cultivated or harvested.

Measurement unit(s):

Percentage

Relevance

Application of the indicator:

The indicator applies to bioenergy production from all bioenergy feedstocks.

Relation to themes:

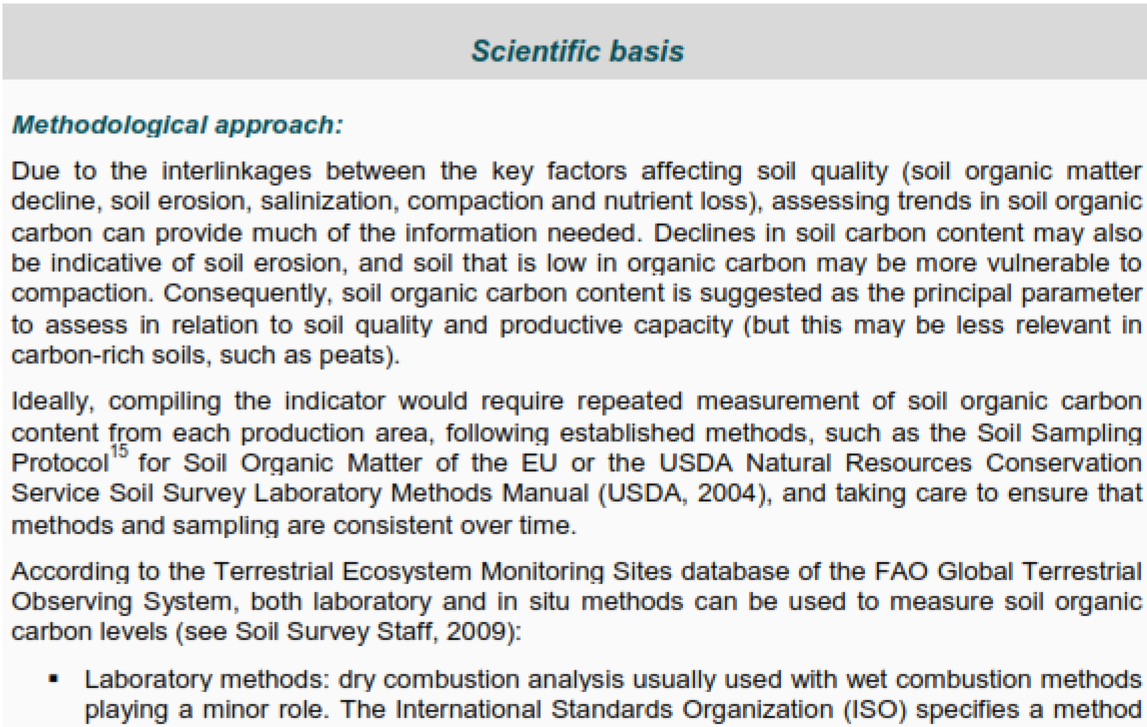
This indicator is primarily related to the theme of *Productive capacity of the land and ecosystems*. Soils are an essential determinant of the productive capacity of the land. Soil degradation, which can be caused by climatic factors, poor agricultural practices and their interactions, can lower the productive capacity of the land. Appropriate agricultural and soil management practices can help to maintain or improve soil quality, and therefore have a positive effect on the productive capacity of the land. The development and use of technologies for soil conservation and management are also key.

To maintain or improve soil quality on land used for bioenergy feedstock production, it is necessary to address the effects of soil and crop management, and in some cases forest and woody vegetation management, on five key factors that contribute to soil degradation:

1. loss of soil organic matter, leading to decreased carbon and soil fertility;
2. soil erosion, leading to soil loss (especially of fertile topsoil);
3. accumulation in soils of mineral salts (salinization) from irrigation water and/or inadequate drainage, with possible adverse effects on plant growth;
4. soil compaction, reducing water flow and storage, and limiting root growth;

GBEP Global Bioenergy Partnership

Structure of an Indicator



Scientific basis

Methodological approach:

Due to the interlinkages between the key factors affecting soil quality (soil organic matter decline, soil erosion, salinization, compaction and nutrient loss), assessing trends in soil organic carbon can provide much of the information needed. Declines in soil carbon content may also be indicative of soil erosion, and soil that is low in organic carbon may be more vulnerable to compaction. Consequently, soil organic carbon content is suggested as the principal parameter to assess in relation to soil quality and productive capacity (but this may be less relevant in carbon-rich soils, such as peats).

Ideally, compiling the indicator would require repeated measurement of soil organic carbon content from each production area, following established methods, such as the Soil Sampling Protocol[15] for Soil Organic Matter of the EU or the USDA Natural Resources Conservation Service Soil Survey Laboratory Methods Manual (USDA, 2004), and taking care to ensure that methods and sampling are consistent over time.

According to the Terrestrial Ecosystem Monitoring Sites database of the FAO Global Terrestrial Observing System, both laboratory and in situ methods can be used to measure soil organic carbon levels (see Soil Survey Staff, 2009):

- Laboratory methods: dry combustion analysis usually used with wet combustion methods playing a minor role. The International Standards Organization (ISO) specifies a method

Global Bioenergy Partnership

Structure of an Indicator

Practicality

Data requirements:

For this indicator to inform about the sustainability of bioenergy production, data from measurements repeated over several years should be compared against baseline data (ideally also collected over several years), meaning that measurements are needed from multiple points in time. The baseline year(s) can be the year in which the production area was first used for cultivation of bioenergy feedstocks, or the one before current bioenergy feedstock production started, or, if data do not exist from those years, the first year for which they are available.

The specific information needs are as follows:

- total land on which bioenergy feedstock is cultivated or harvested (in hectares or square kilometres);
- soil organic carbon content for each bioenergy production site (mg of organic carbon per g of soil sample);
- where focus is to be limited to areas at high risk of soil quality decline data are needed on risk factors for nutrient loss, erosion, soil compaction or salinization based on site scale assessments and/or mapped information. These can usefully be summarized by area (e.g. "X square kilometres of the production area are on slopes higher than 5 degrees");
- depending on the risk assessment:

Data sources (international and national)[18]:

This indicator requires field measurements within bioenergy production areas. Soil legacy data (soil profiles and maps) are available in many countries (in agricultural departments of national governments and national research institutions) and in institutions like FAO, and may prove useful sources of data. A Global Soil Partnership (GSP) is being created to mobilize such soil information, in which countries are to be active participants. Soil legacy data and international datasets are likely to be especially relevant for risk assessment and possibly for establishing baselines. Other potentially relevant sources include:

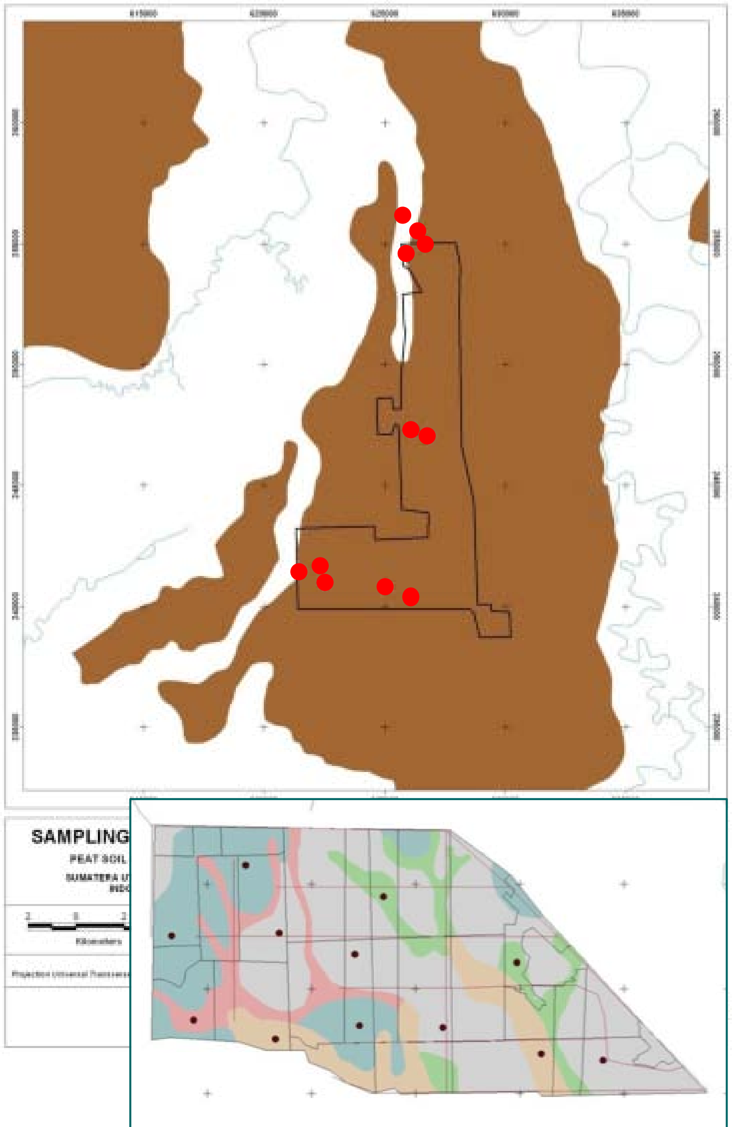
GBEP
Global Bioenergy Partnership

LEVEL OF AGGREGATION

- Many GBEP indicators rely upon data collected at the household, farm and production unit levels.
- All the indicator values can be aggregated or averaged to the national level to give a summary of the impacts of a national bioenergy programme.
- In some cases, a smaller spatial area, e.g. the watershed, is the most appropriate level to inform policymaking.
  - But even here a useful national-level indicator could be formed (e.g. percentage of bioenergy produced in water-scarce watersheds). And local conditions can be built into aggregated indicators by measuring deviation from a local level.
- Different forms of aggregation are also useful, so that governments can see the extent to which different bioenergy practices used in their country are aligned with their policy objectives, and how impacts vary across region, ecosystem, section of society etc.

GBEP
Global Bioenergy Partnership

Primary data campaign: Indonesia



Indicator 2 – Soil Quality

- Brown: peat soil
- Red dots: sampling sites
- Black line: plantation borders

Soil quality sampling on peat soils

Primary data campaign: Indonesia

Indicator 6 – Water Quality

Effluent treatment/containment at CPO mill

Measuring infiltration rate

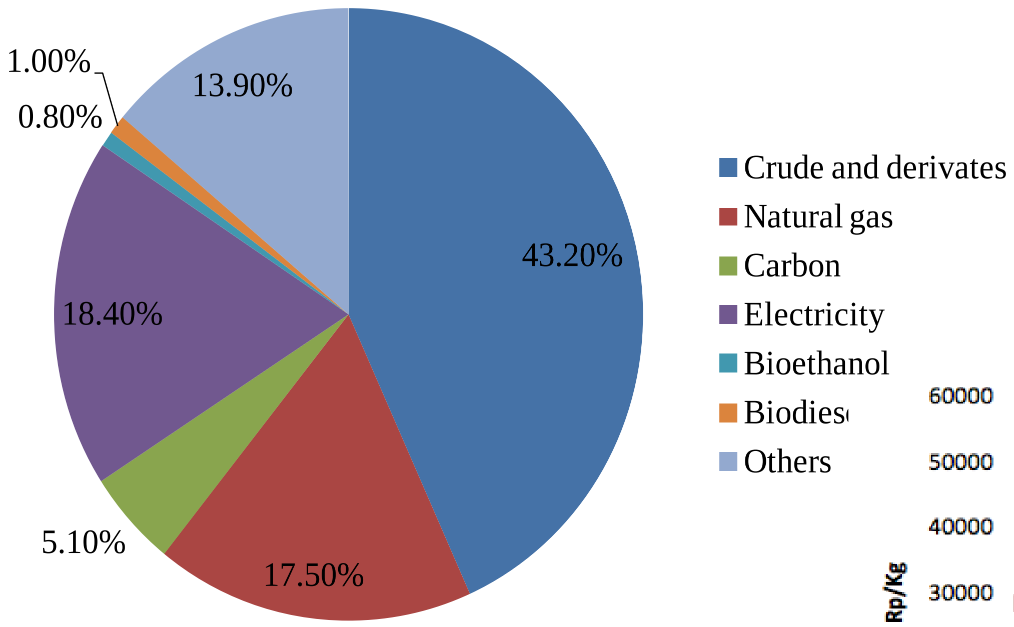
Parameter	Observation period						Average	Standard
	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12		
BOD (mg/L)	26	47	35	46	20	34	**37.26**	**100**
COD (mg/L)	56	126	86	94	48	83	**91.49**	**300**
pH	7.6	8.2	7.2	7.5	7.61	7.6	**7.68**	**6-9**
TSS (mg/L)	14	22	46	46	13	22	**39.75**	**100**
Sulfida (mg/L)	0.02	0.015	0.028	0.051	0.023	0.038	**0.02**	**0.5**

Volume of water effluent: 651m^3/day

Ethanol facility effluent water quality

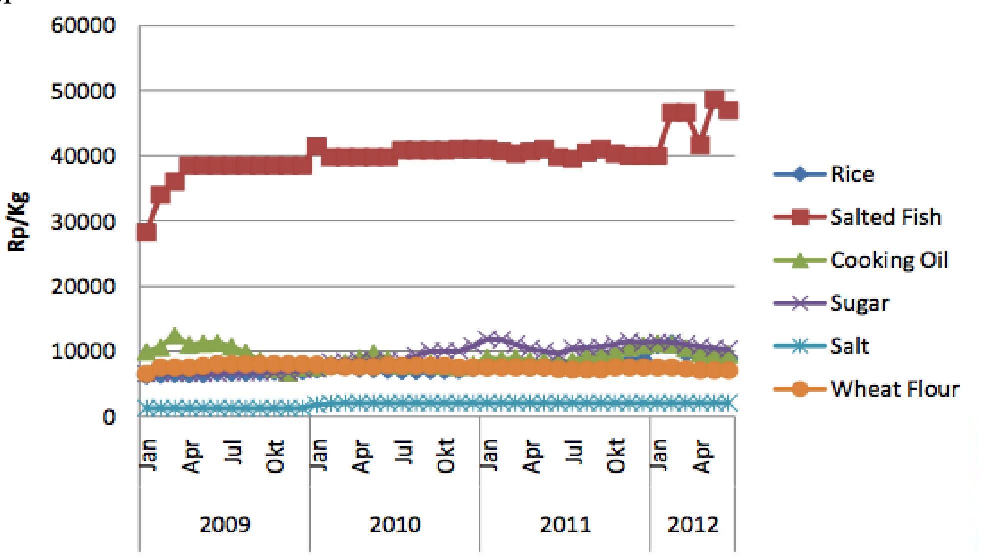
Secondary data

Indicator 22 – Energy Diversity



Indicator 10

Food prices over time



Pilot testing projects

To date 6 countries have been testing the GBEP Indicators:

1. **Japan (Kyoto Province)**
2. **Ghana**
3. **The Netherlands**
4. **Germany** (in progress)
5. **Colombia** (in progress)
6. **Indonesia** (in progress)

In the near future others are expected to begin the pilot testing:

1. **Argentina**
2. **Jamaica**
3. **USA**
4. **Italy**
5. **Brazil**

GBEP Global Bioenergy Partnership

Concluding

The GBEP Sustainability Indicators are a valuable tool for understanding the current status of bioenergy sustainability in a country and its human and institutional capacity;

In this phase it is important to test the indicators in many different conditions and countries and to disseminate results of the analysis;

If measured over time, the indicators will produce a wealth of information that can be used by countries to drive policy, investments, and development of the sector.

GBEP
Global Bioenergy Partnership

Thank you

Marco Colangeli
Programme Advisor

GBEP Secretariat
Food and Agriculture Organization of the United Nations (FAO)
Viale delle Terme di Caracalla 00153 Rome - ITALY
Tel.: +39 06 570 54760
Fax: +39 06 570 53369
E-mail: Marco.Colangeli@fao.org
www.globalbioenergy.org

GBEP
Global Bioenergy Partnership