Indirect effects of bioenergy: international standards and science

"Policies for the Sustainable Development of Biofuels in Pan America" session

PAN AMERICAN BIOFUELS AND BIOENERGY SUSTAINABILITY
AN NSF RESEARCH COORDINATION NETWORK

Recife, Brazil
July 23, 2014

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CBES
Center for BioEnergy Sustainability

Climate Change SCIENCE INSTITUTE

In collaboration with Keith Kline (ORNL) and conveners of the working group, Fred Ghatala & Diego Goldin, as well as Chuck Corr and the US Technical Advisory Group for ISO 13065 , & other ORNL staff from Center for BioEnergy Sustainability

Special thanks to Kristen Johnson and Alicia Lindauer, Alison Goss Eng, among others at the Department of Energy (DOE), BioEnergy Technologies Office (BETO)

Views expressed are the author's.

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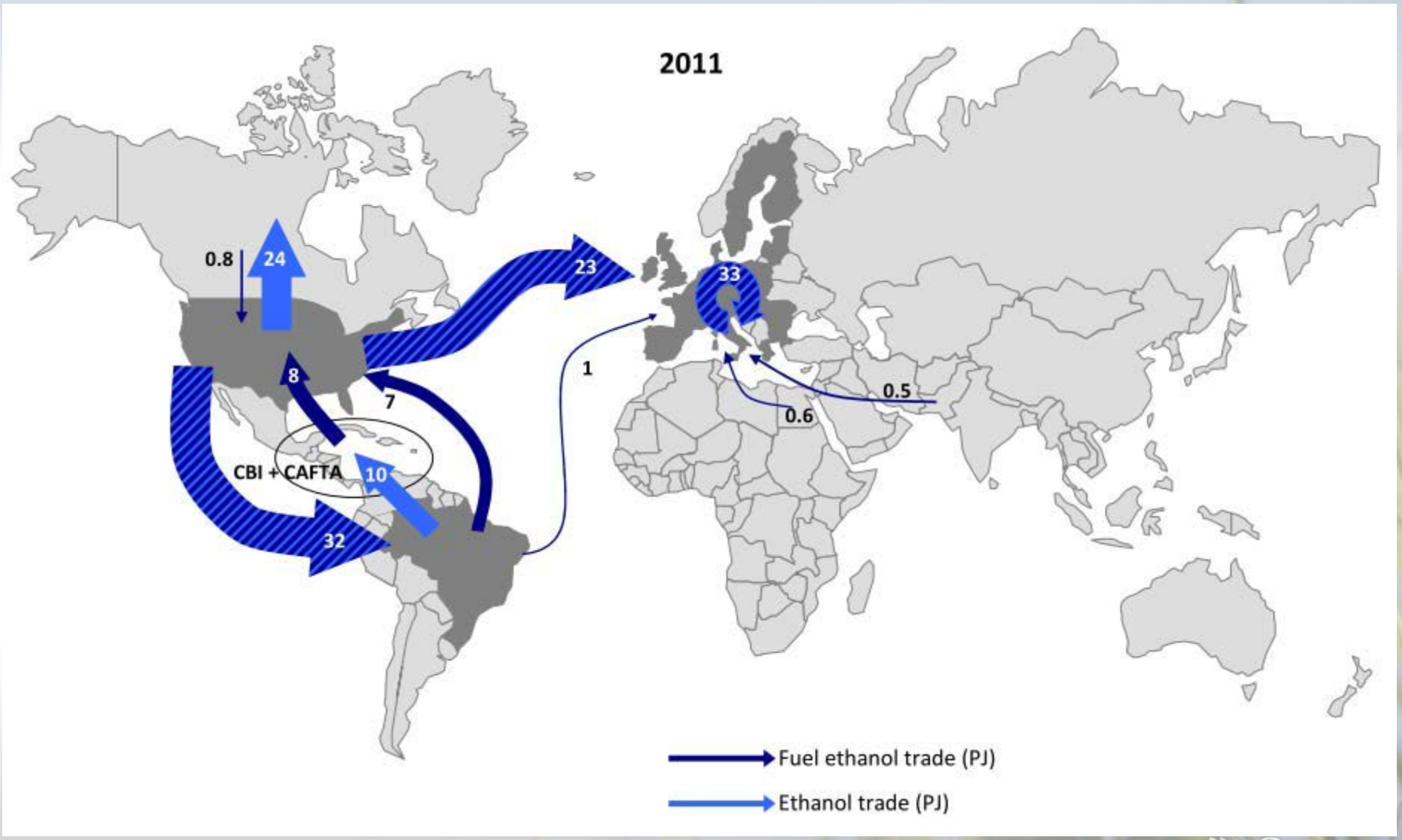
Outline

- Relevance
- Background:
  - International Organization for Standardization- ISO 13065 “Sustainability Criteria for Bioenergy”
  - Group to assess the state of the science of “indirect effects”
- Conclusions:
  - Diverse results represented in literature
  - Consensus statement
- Resolutions
- Concluding remarks

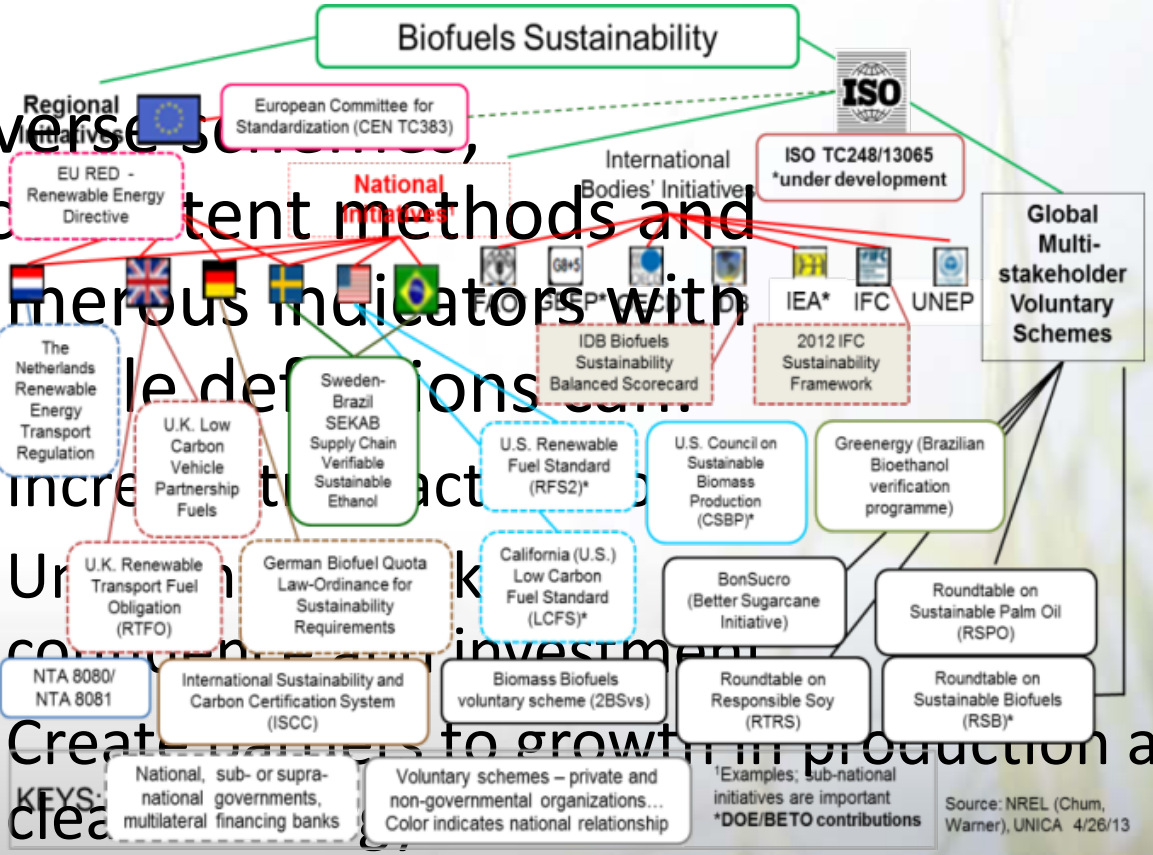
Relevance – bioenergy trade, bio-economy



Source: Lamers et al., RSER, 15 (2011) 2655– 2676

Relevance: Standards & Industry

- Barriers and inefficiencies are emerging from requirements for sustainable bioenergy
- Diverse schemes, inconsistent methods and numerous indicators with variable definitions can:
  - Increase transaction costs
  - Undermine market confidence and investment
  - Create barriers to growth in production and trade of clean energy



Background: International Standards

What is a standard?

- A standard is a document that
  - Provides consistency
    - In requirements
    - In guidelines
    - In specifications
  - Can be used to ensure consistent and appropriate
    - Materials
    - Products
    - Processes
    - Services

Why develop standards?

- Comparable assessment
- Help ensure products and services are "fit for purpose"
- Reduce costs by minimizing waste and errors; increasing productivity
- ***Facilitate free and fair global trade***
  - **Access to new markets**
  - **Level the playing field for new entrants**

Source: adapted from www.ios.org

Background: Approach & Objectives

- Guide efforts toward science-based approaches
  - Help to determine state of science on controversial and politicized issues
- Enable informed decisions about energy choices that support continual improvements in energy systems
- Develop consensus on common terms and methods

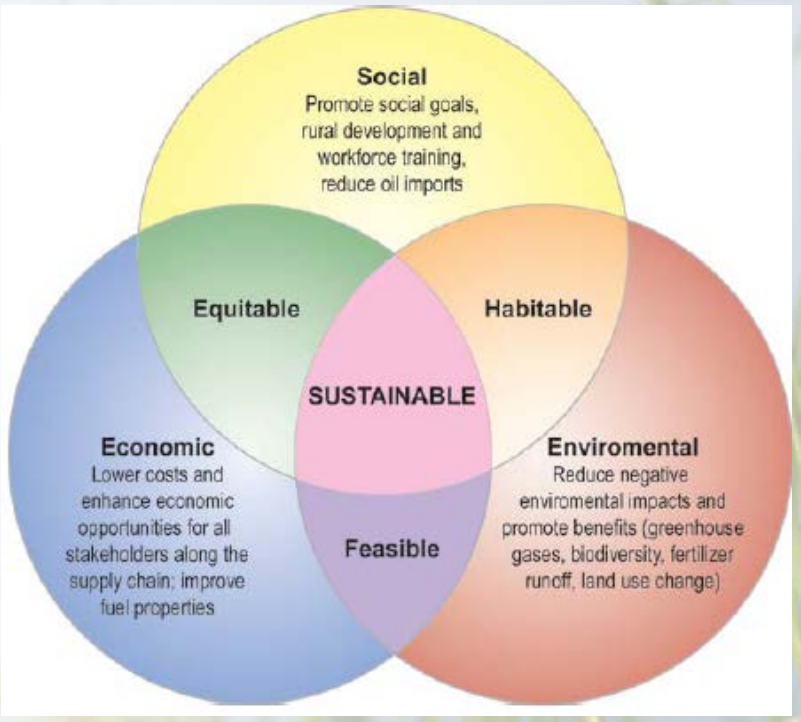


FIG from BETO MPP. Slide adapted from KL Kline presentation for DOE EERE webinar, "Global Solutions for Global Challenges: International Collaborations to Advance Bioenergy Research"

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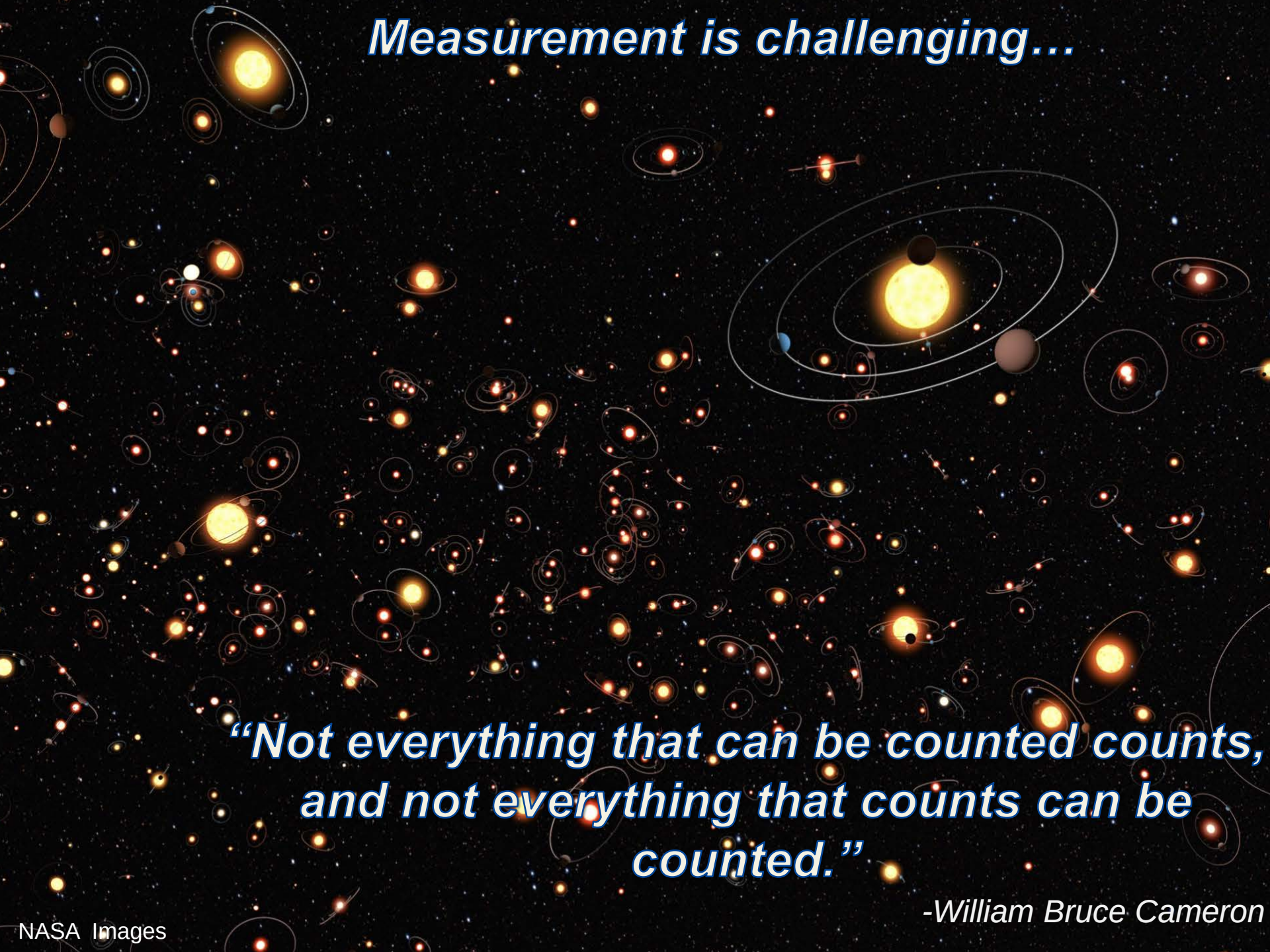
Photo credit: Orbiter News Dec. 22, 2010


Measurement is challenging…
“Not everything that can be counted counts, and not everything that counts can be counted.”
-William Bruce Cameron
NASA Images

Background: Why ISO?

- Global reach and impact
  - 163 member countries
  - 19,500 published International Standards
- Rio 1992: Series of Environmental Standards (ISO 14000)
  - 250,000 users
  - Applied in 155 countries
- Social Responsibility (ISO 26000:2010)
- ISO 14064:2006 and ISO 14065:2007 standards to provide
  - An internationally agreed framework for measuring GHGs
  - so that " a tonne of carbon is always a tonne of carbon"

International Organization for Standardization

Source: http://www.iso.org/iso/rio_20_forging_action_with_agreement.pdf

ISO 13065 "Sustainability Criteria for Bioenergy"

"Standardization in the field of sustainability criteria for **production, supply chain and application of bioenergy**."

Indirect effects work group mandate: "critically assess and present results on indirect effects" (e.g., LUC and food security)

Foundation:

ISO guidelines for drafting of standards states that:

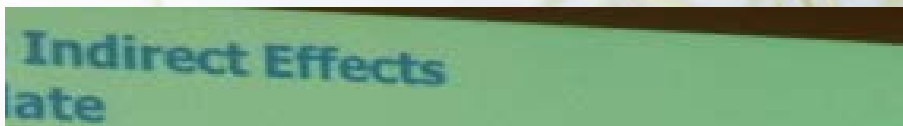
> "Test methods should be clearly identified and be consistent with the purpose of the standard. **They should be objective, concise and accurate, and produce unambiguous, repeatable and reproducible results,** so that results of tests made under defined conditions are comparable" (ISO 1994).

Process: 161 publications reviewed; 4 reports submitted (2012-13)

Indirect effects work group - Results

Literature Review/Statements on State of Science Applicable to Indirect Effects:

United Nations (UN)-Energy (2000). Sustainable Bioenergy: A framework for decision makers. p. 1-61.



"If biofuel feedstock production competes for water supplies, it could make water less readily available for household use, threatening the health status and thus the food security status of affected individuals. On the other hand, if modern bioenergy replaces more polluting sources or expands the availability of energy services, it could make cooking both cheaper and cleaner, with positive implications for food utilization." (p. 31)

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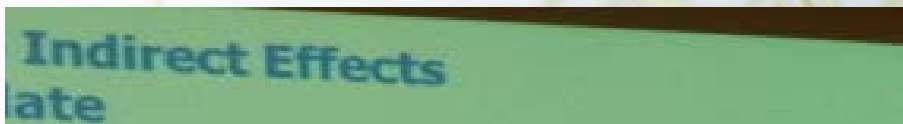
Indirect effects work group - Results

Literature Review/Statements on State of Science Applicable to Indirect Effects:

Babcock, B. (2011). The Impacts of US Biofuel Policies on Agricultural Price Levels and Volatility. Issue Paper No. 35. International Centre for Trade and Sustainable Development.

"These results indicate that US ethanol subsidies during this period had little impact on consumer prices and quite modest impacts on crop prices." (pg. vii)

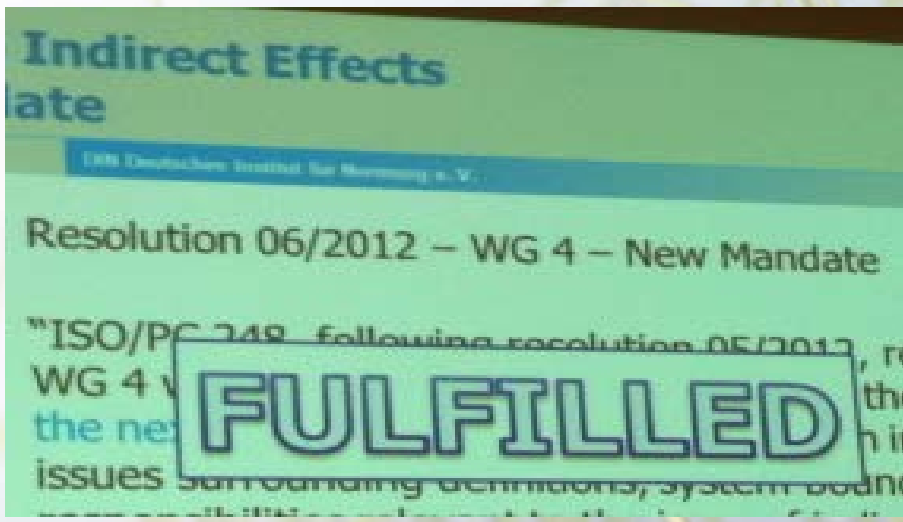


Indirect effects work group - Results

Literature Review/Statements on State of Science Applicable to Indirect Effects:

Berndes, G., Bird, N., & Cowie, A. (2010). Bioenergy, land use change and climate change mitigation. IEA Bioenergy, ExCo: 2010:03.

"The GHG effects of LUC are difficult to quantify with precision in relation to a specific bioenergy project, particularly for iLUC where the causes are often multiple, complex, interlinked and change over time." (p. 6)



Indirect effects work group - Results

Literature Review/Statements - Continued:

Baffes, J., & Haniotis, T. (2010). Placing the 2006/08 commodity price boom into perspective. Policy Research Working Paper 5371. The World Bank. July, 2010.

"This paper concludes that **a stronger link between energy and nonenergy commodity prices is likely to be the dominant influence on developments in commodity, and especially food, markets**. Demand by emerging economies is unlikely to put additional pressure on the prices of food commodities. The paper also argues that the **effect of biofuels on food prices has not been as large as originally thought, but that the use of commodities by financial investors (the so-called "financialization of commodities") may have been partly responsible for the 2007/08 spike.** ..." (p. i)

Indirect effects work group - Results:

WG4 summary consensus from report submitted to PC on Feb 17, 2012:

The science on indirect effects is nascent and rapidly evolving. This makes it difficult to reach consensus on the state of the current science.

The conclusion, based on the expertise of, and literature reviewed by, the work group, is that **the state of the science in terms of evidence based research is inconclusive or contradictory regarding indirect effects of bioenergy.**

Indirect effects work group - Results:

- **WG4 summary consensus continued:**

There has been more emphasis on sustainability and indirect effects of bioenergy than on baseline (often fossil fuel) scenarios.

Recommendations:

An economic operator should not be held responsible for indirect effects

Model input assumptions require more corroboration from evidence-based research

There needs to be equitable treatment of direct and indirect effects for any energy options being analyzed including baseline fuel(s) that would be replaced by proposed bioenergy sources.

Indirect effects work group- Resolutions

Definitions:

Direct effects can vary widely and their measurement will depend on the defined system boundaries for analysis.

Estimation and attribution of indirect effects depend on quantitative and qualitative methods and assumptions used.

The Standard considers the measurable effects that are under the control of the economic operator and caused by the process being analyzed

Concluding remarks

Successful sustainability assessment requires:

- Agreement on goals and purpose (priorities)
- Valid representation of conditions based on clear, consistent definitions for variables of concern; e.g.,:
  - land attributes (primary forest, grassland, high-carbon…)
  - management practices
  - baseline trends and change dynamics
- Understanding causes and effects (empirical data to test models and hypotheses)
- Effective incentives for compliance and continual improvement

Successful standard requires low transaction costs relative to value-added

Thank you

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http://www.ornl.gov/sci/ees/cbes/
See the website for: Reports, Forums, presentations, publications

Department of Energy (DOE), BioEnergy Technologies Office (BETO)

This research was supported by the U.S. Department of Energy (DOE) Bio-Energy Technologies Office and performed at Oak Ridge National Laboratory (ORNL). Oak Ridge National Laboratory is managed by the UT-Battelle, LLC, for DOE under contract DE-AC05-00OR22725. The views in this presentation are those of the authors, who are responsible for any errors or omissions.

Acknowledgements:
Fred Ghatala (Waterfall group-Canada), Diego Goldin (INTA-Argentina), Michael Wang (ANL), Chuck Corr, Paul Trupo, Chris Farley, Fahran Robb, US TAG, and ISO PC248; Helena Chum; Tom Wilbanks, Virginia Dale and ORNL CBES colleagues, B Davison, LM Eaton, RA Efroymson, PN Leiby, M Langholtz, LR Lynd, A McBride, GA Oladosu, ES Parish, RD Perlack, N Singh, S Kang, SB Wright, LL Wright; and DOE OBP staff Zia Haq, Kristen Johnson, Alicia Lindauer-Thompson, P Grabowski, A Goss-Eng.

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References

- Dale VH, KL Kline, LL Wright, RD Perlack, M Downing, RL Graham. 2011. Interactions among bioenergy feedstock choices, landscape dynamics and land use. *Ecological Applications* 21(4):1039-1054.
- Efroymson, R. A., V. H. Dale, K. L. Kline, A. C. McBride, J. M. Bielicki, R. L. Smith, E. S. Parish, P. E. Schweizer, D. M. Shaw. 2012. Environmental indicators of biofuel sustainability: What about context? Environmental Management DOI 10.1007/s00267-012-9907-5
- Giglio L., J. T. Randerson, G. R. van derWerf, P. S. Kasibhatla, G. J. Collatz, D. C. Morton, and R. S. DeFries. Assessing variability and long-term trends in burned area by merging multiple satellite fire products. Biogeosciences, 7, 1171–1186, 2010.
- Kline KL, et al. 2011. Scientific analysis is essential to assess biofuel policy effects [published as a peer-reviewed article] in response to the paper by Kim and Dale on "Indirect land use change for biofuels: Testing predictions and improving analytical methodologies."] *Biomass and Bioenergy*
- Kline KL, Dale VH, Grainger A. 2010. Challenges for Bioenergy Emission Accounting. *Science e-letter.* (2 March 2010)
- Kline, KL and Dale, VH. 2008. Biofuels, causes of land-use change, and the role of fire in greenhouse gas emissions. Science 321:199 http://www.sciencemag.org/cgi/reprint/321/5886/199.pdf

- Kline KL, Dale VH, Grainger A. 2010. Challenges for Bioenergy Emission Accounting. *Science e-letter.* (2 March 2010)
- Kline, KL and Dale, VH. 2008. Biofuels, causes of land-use change, and the role of fire in greenhouse gas emissions. Science 321:199 http://www.sciencemag.org/cgi/reprint/321/5886/199.pdf

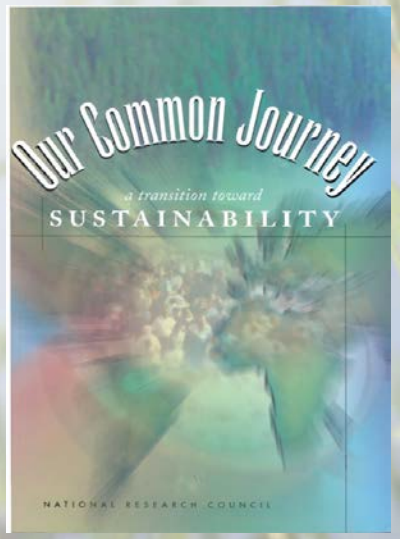
- Lamers, P, C Hamelinck, M Junginger, and A Faaij, 2011. Renewable and Sustainable Energy Reviews 15: 2655–2676
- International Energy Agency (IEA), Technology Roadmap: Biofuels for transport, 2011. Accessed from http://www.iea.org/publications/freepublications/publication/Biofuels_Roadmap_WEB.pdf

- **References included in indirect effects literature review and quoted here are available by request. Please email me at davismr@ornl.gov**

Parting thoughts– why ‘sustainable’ bioenergy?

Ethical and scientific considerations

- Conserve resources for future generations
- Efficient alternatives to fossil fuels needed
- Improve land use efficiency
  - Incentives to invest in better soil management
  - Over 400 million hectares burn *each year*
- Sustainable development goals
  - “Living within our means”
  - Integrated land-use planning
  - More sustainable rural livelihoods
- Climate change, resilience and adaptation
  - Incentives to manage landscapes for multiple benefits including climate change mitigation and improved system resilience



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Parting thoughts– standards

Can certification ensure sustainability?

No, *because n*othing can **ensure** sustainability and…

1. There are too many opportunities for substitution in biomass markets
2. Transaction costs for certification, monitoring and verification are too high relative to value of products
3. *Uncertainty:* is there political will and sufficient market premium to justify certification?
4. "Setting a bar" does not necessarily improve anything (e.g., wastes)
5. Even well-designed schemes can be too easily "gamed" and it only takes a few well-publicized cases to undermine credibility

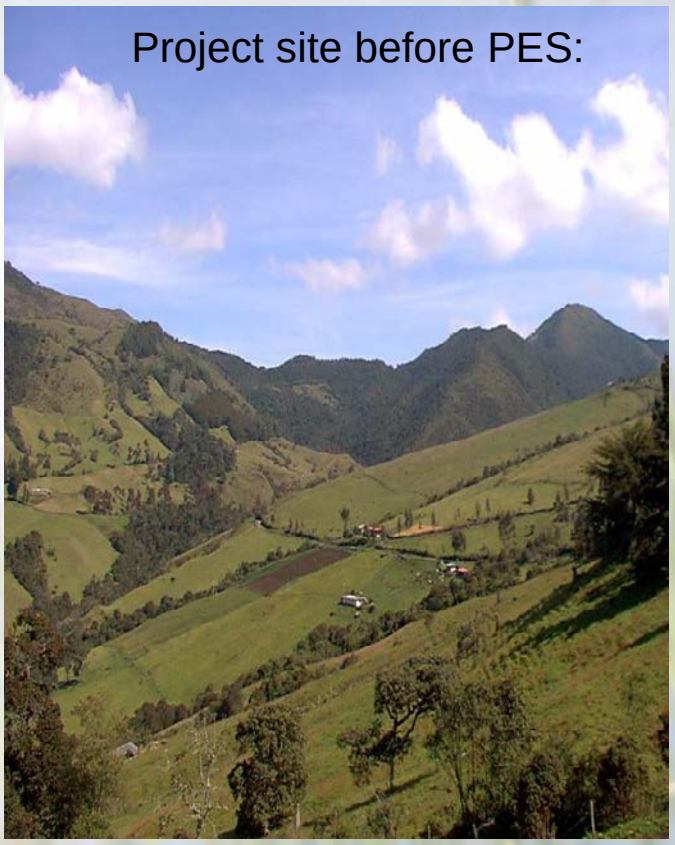


Photo: José Luis Gómez; Fondo Acción, Colombia

Slide adapted from Kline presentation for IEA Joint Task 38-40-43 presentation on LUC: http://ieabioenergy-task38.org/workshops/campinas2011

Parting thoughts– standards

Can a standard support more sustainable outcomes?

Yes, *if* it –

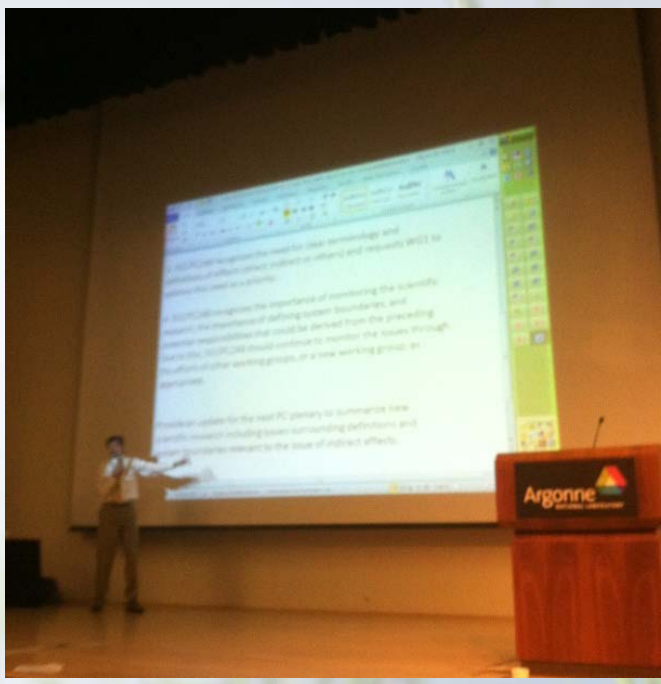
1. Is developed with users to meet their needs (context specific)
2. Provides science-based tools that promote learning
3. Creates incentives that shift production toward more sustainable paths
4. Is adaptable to changing contexts and priorities
5. Encourages all to participate
6. Can be implemented on a "level playing field"
7. Is transparent and easily adopted.

Photo: José Luis Gómez; Fondo Acción, Colombia

Slide adapted from Kline presentation for IEA Joint Task 38-40-43 presentation on LUC: http://ieabioenergy-task38.org/workshops/campinas2011 also available on CBES website .

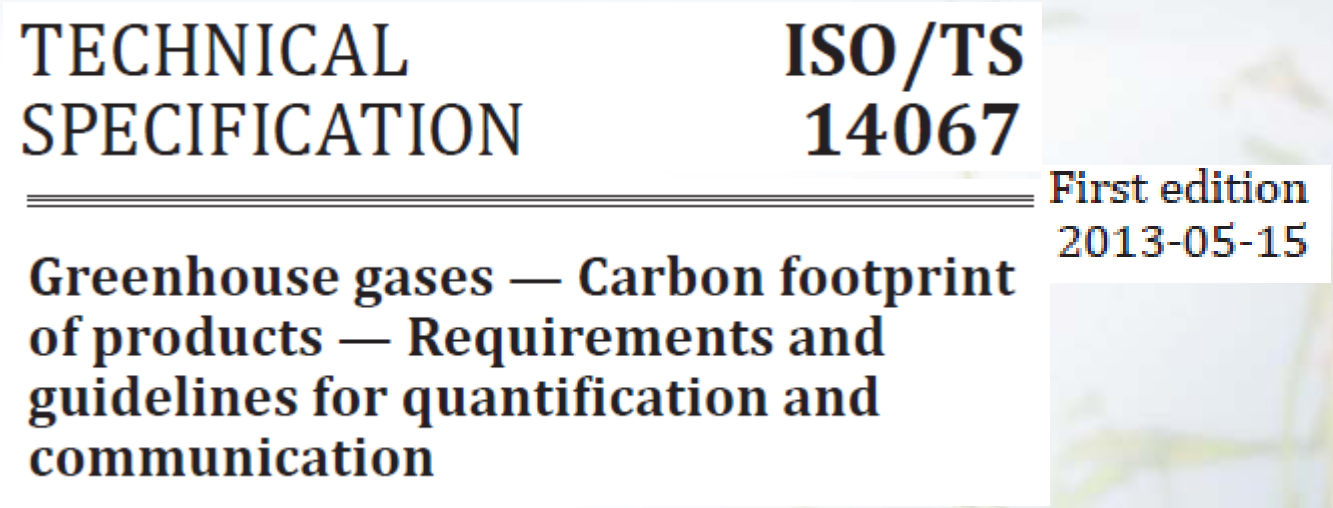
Supplementary information on ISO 13065, Process to date:

- Proposed by Germany, Brazil (2008)
- Mandate approved (2009)
- Work groups finalized (2011)
- Over 40 entities on the Project Committee (PC-248)
- Committee reviewing 830 comments received on 2nd Draft
  - An intermediate draft was approved to continue to a draft international standard ballot
- Target completion and publication date: 2016



ISO 13065, GHG Methodology Work Group

References TS 14067 and explains applicability to bioenergy


TECHNICAL SPECIFICATION

ISO/TS 14067

First edition 2013-05-15

Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification and communication

Specifies principles, requirements and guidelines for the quantification of the carbon footprint of a product (CFP), based on ISO 14040 and ISO 14044 and on environmental labels and declarations (ISO 14020, ISO 14024 and ISO 14025 for communications)