

Critical indicators of sustainability for biofuels

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Environmental criteria and indicators

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12 key principles (each with one or more criteria) for sustainability

Similar to, but not identical to, existing frameworks for sustainable forest management (Canada, elsewhere)

Probably the best current framework to certify that biofuels and bioproducts are sustainable

A critical question: where does the data come from to support the RSB?

12 Principles

1. Legality
2. Planning, monitoring, and continuous improvement
3. Greenhouse gas emissions
4. Human and labour rights
5. Rural and social development
6. Local food security
7. Conservation
8. Soil
9. Water
10. Air
11. Use of technology, inputs, and management of waste
12. Land rights

Environmental, social, economic criteria

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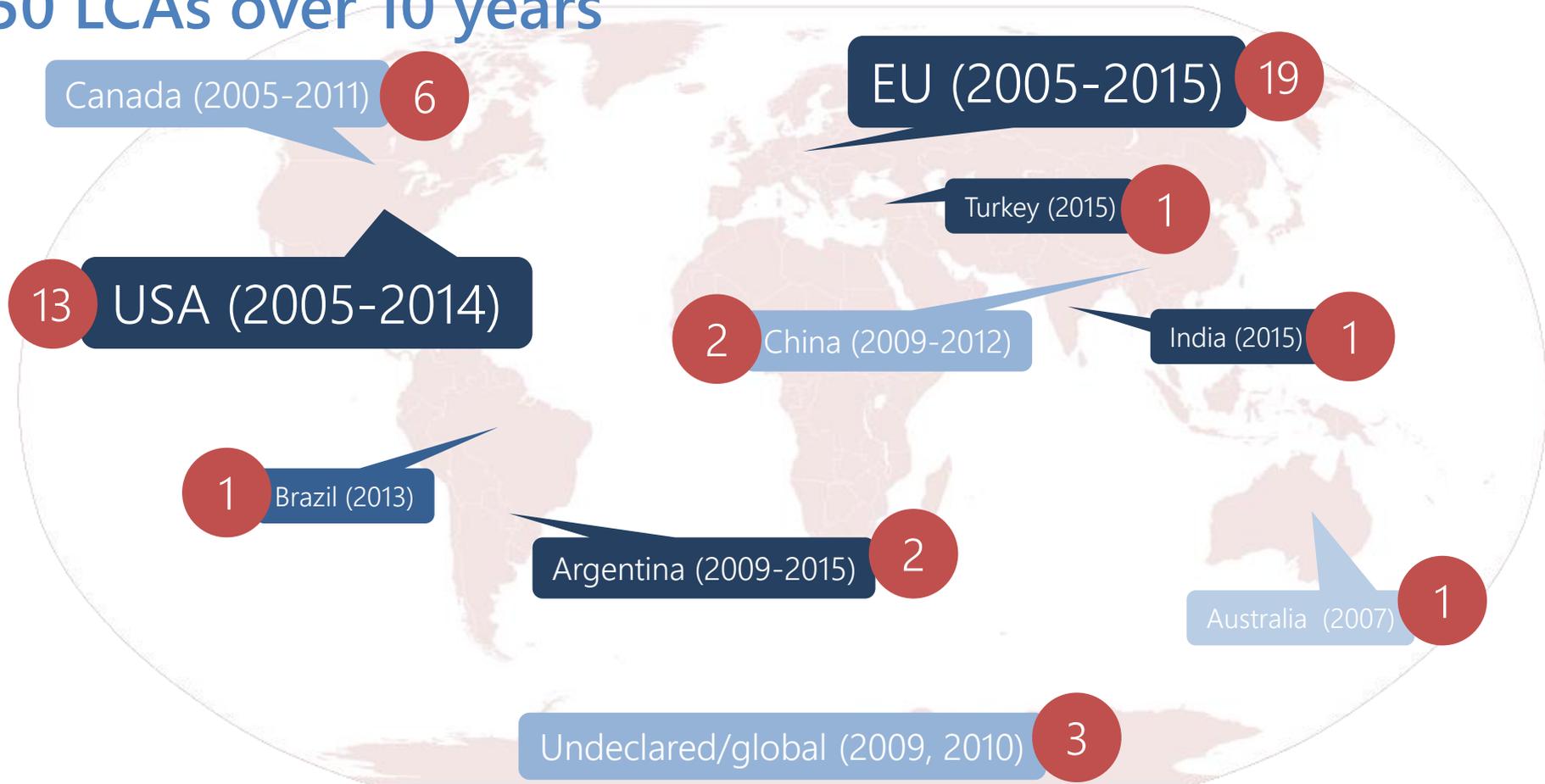
Use of LCAs to inform the RSB

LCA data essential to understand the environmental impacts of fuels, chemicals, and materials

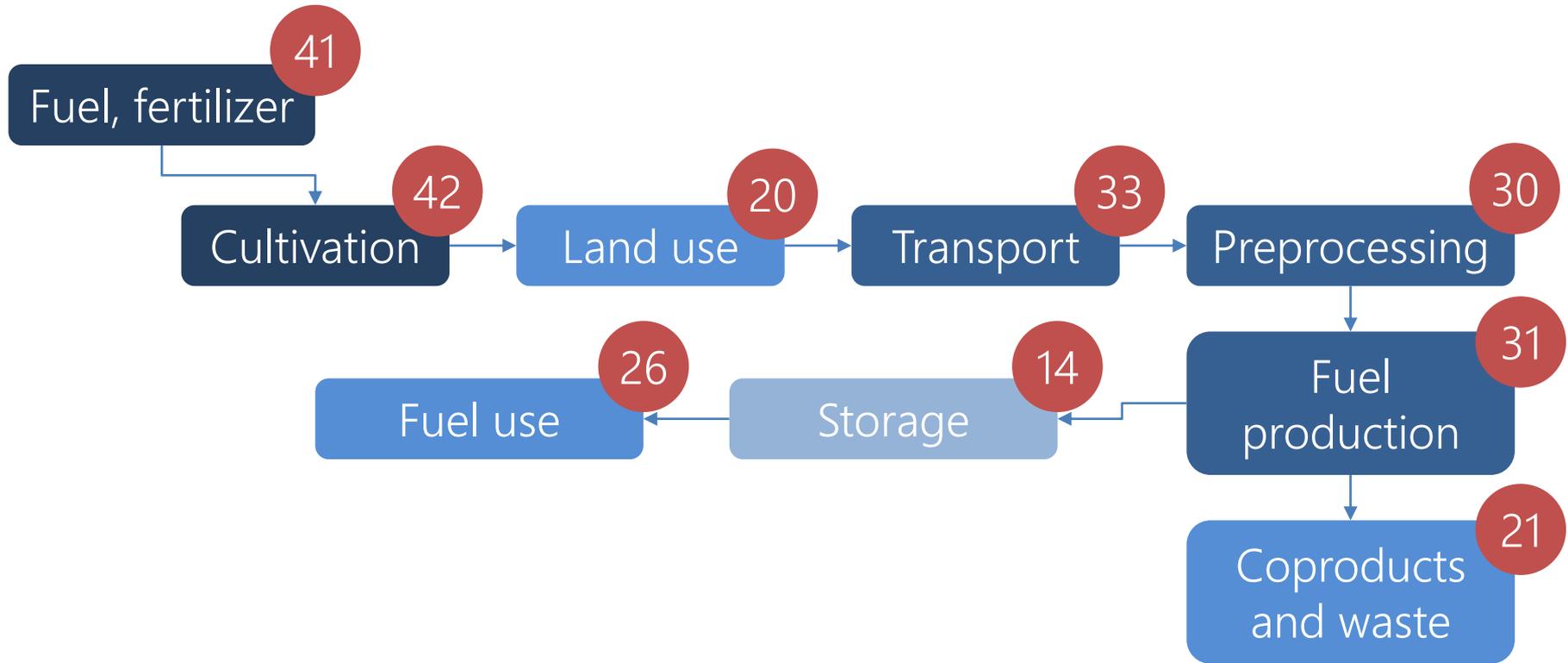
A life cycle approach can be used to assess costs or economic impacts as well

Some studies are extending the concept to look at social issues

50 LCAs over 10 years



Coverage of process stages



Only 1 study covered all nine stages; 5 covered eight; 9 covered seven stages

Key environmental indicators

Abiotic depletion 23

Eutrophication 24

16 ENERGY USE

Acidification 26

ECOTOXICITY 9

Global warming potential

16 *ozone depletion*

WATER USE 2

LAND USE 16

Ionizing radiation 1

13 Photochemical oxidation

Particulate matter formation 2

HUMAN TOXICITY 16

Key social indicators

Direct, indirect and induced job creation **6** income and development opportunities to rural communities **3**

2 Human rights, working conditions, property violations, social well-being, integrity of the company, direct employment generation

Diseases, indigenous rights, gender equity, conflict, obesity; child labour, forced labour, minimum wages, labour laws, migration, unemployment; fatal and non-fatal injuries, occupational health, noise exposure; Large land holding, hospital beds, rural sanitation; corruption, legal system

Rising employment

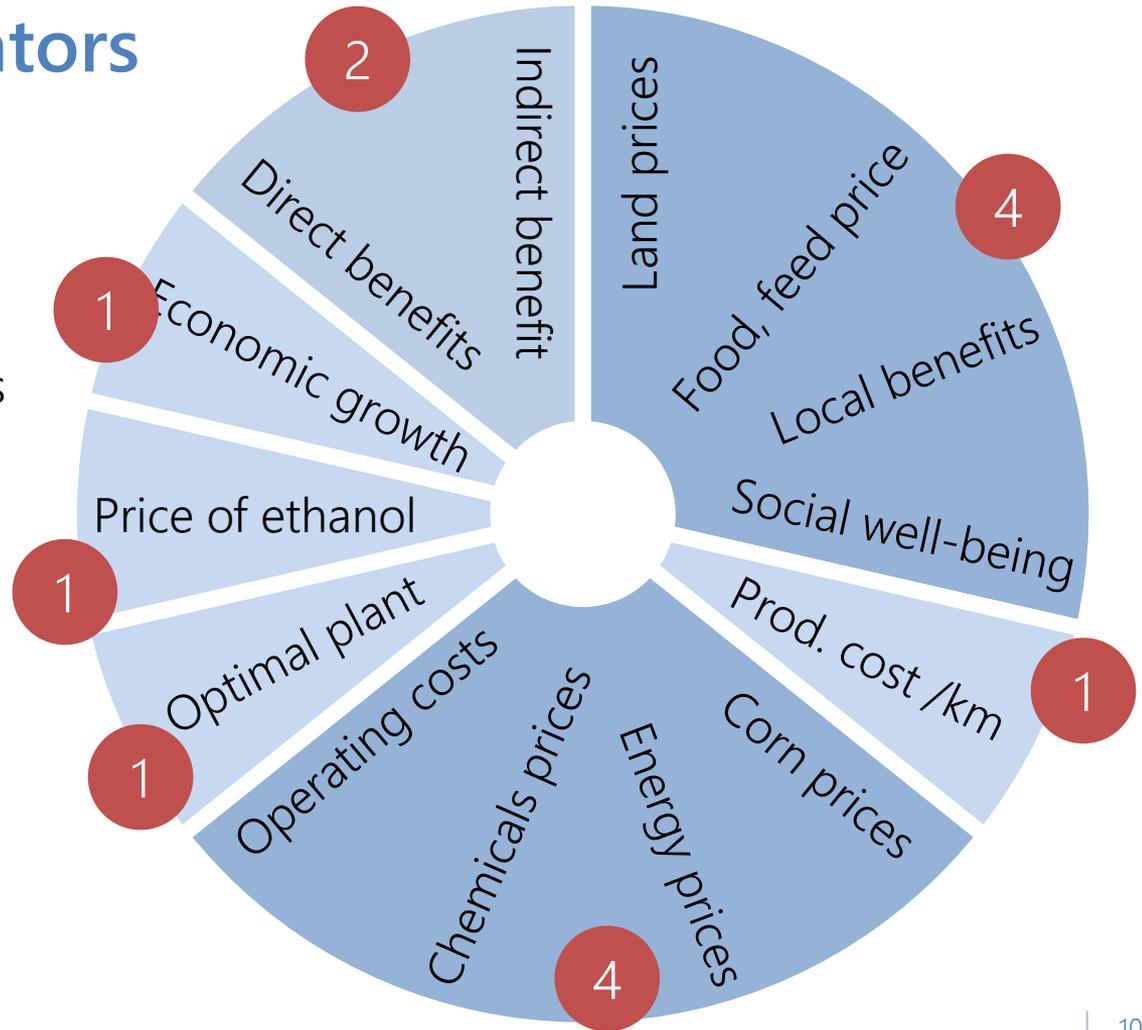
Direct and indirect effects of bioethanol production

Inclusion of small-scale farmers in the supply chain; on-site, off-site food security water security (feedstock and process related); biodiversity security; employment generation for low-skilled workers; inclusion of small-scale producers

Key economic indicators

Not much consistency between the different studies – different indicators used in different places

Suggests a huge amount of work required to standardize impact assessments



Discussion

Of 50 studies selected, 47 covered environmental indicators; only 7 studies explored economic indicators, and only 6 investigated social indicators

Only one study actually explored a combination of environmental, economic, and social parameters

Criterion 11 (referring to technology, inputs, and management of waste) is not covered by existing LCA analyses;

Three other criteria (1, 6, 7) are only partially addressed, through one or two studies each

Takeaway

Review suggests that LCA approaches to impact assessment, while becoming more holistic across all aspects of sustainability, are still not sufficient to completely inform the full range of criteria laid out by the RSB

Several critical criteria not described in any existing LCA studies

If we presume that LCA is the best tool to inform criteria and indicators, the existing range of studies are not sufficient to do the job

In the future, LCA could be further extended to help address critical criteria within the RSB framework

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