

## The sustainability of biofuels in Asia from economic and social perspectives

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*Expert Workshop on Biofuels: Evaluation of the sustainability of biofuels from multiple perspectives*

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# IGES Biofuel Project ◆ IGESバイオ燃料プロジェクト

- This presentation is based on the research results of the IGES Biofuel Project
- IGES is participating in joint research, “Biofuels for Sustainable Development (BforSD) funded by the Global Environment Research Fund of the Ministry of Environment, Japan
- IGES research focuses on economic, social, and environmental impacts of biofuels in the Asian region
- This presentation focuses on results of case study research:
  1. **China**
  2. **India**
  3. **Indonesia**
  4. **Japan**



# Expected benefits of biofuels

## ◆ バイオ燃料から期待される便益

### Energy

- Energy security
- Replace fossil fuels
- Basic energy services

### Economy

- Jobs
- Rural development
- Poverty reduction

### Environment

- Greenhouse gas reduction
- Air pollution

**Can these benefits be achieved?**

# Overview of Biofuel Policies in Case Study Countries

Country	Blend	Overall	Targets & policies
Indonesia	E5	<ul style="list-style-type: none"> <li>Gov't views current ambitious strategy as unrealistic; now considering revisions</li> </ul>	<ul style="list-style-type: none"> <li>National Energy Program, target B20 and E15 in 2025</li> <li>Diesel: subsidies (at same level as fossil fuel)</li> </ul>
India	E5	<ul style="list-style-type: none"> <li>Gov abandoned recent ambitious but unrealistic new strategy; now revising</li> <li>Several states actively promote biofuels, including pilot projects</li> <li>Focus on use of wastelands, rural development</li> </ul>	<ul style="list-style-type: none"> <li>Biofuel National Strategy, 2008 / target 20% biodiesel and bioethanol by 2017 (abandoned)</li> <li>Subsidies, tax &amp; price incentives</li> </ul>
China	E10	<ul style="list-style-type: none"> <li>Initial rapid promotion slowed to minimize food-fuel conflict</li> <li>Still world's 3<sup>th</sup> largest bioethanol producer</li> <li>Focus on alternative feedstocks, 2<sup>nd</sup> generation</li> </ul>	<ul style="list-style-type: none"> <li>Biofuel 15% of transport energy by 2020</li> <li>Subsidies, tax &amp; price incentives</li> </ul>
Japan	E3 Upper limit	<ul style="list-style-type: none"> <li>Strategy is modest compared to other countries, but still difficult to achieve</li> <li>Emphasis on 2<sup>nd</sup> generation, R&amp;D</li> <li>Desire for domestic production but heavy reliance on imports (from Europe &amp; Brazil)</li> </ul>	<ul style="list-style-type: none"> <li>Plan to replace 500 ML/year of transport petrol with liquid biofuels by 2010</li> <li>Subsidies, pilot projects, tax incentives</li> </ul>

## Observations on Policy Trends in Case Study Countries (China, India, Indonesia)

- Oil price crash & economic crisis severely harmed economic viability of biofuels (also reduced environmental impacts) worldwide
  - Governments (especially India and Indonesia) are scaling back overambitious plans (targets were overambitious even in the peak period)
- Governments now recognize that overdependence on one feedstock is undesirable
- Governments are more sensitive to the food-fuel conflict
- Governments & businesses are increasing research & testing of alternative feedstocks including 2<sup>nd</sup> generation
- More recognition about limitations of biofuels for energy security, more emphasis on rural development.

## Key Issue: Land and Water Availability

## ◆ 主要な課題： 土地及び水資源の利用可能性

➤ Potential for large scale biofuel use is limited by land and water availability

### Land:

- Ethanol and biodiesel accounted for less than 2% of global transport fuels in 2007; this may rise to between 3 and 10% by 2030 (FAO).
- The largest potential source of additional land in Asia would involve deforestation (Indonesia, Cambodia, Laos, Vietnam, etc.).
- This would offset GHG benefits, harm biodiversity
- Agricultural land is disappearing for many reasons (for example, houses), not just because of biofuels.

### Water:

- Severe water shortages in many Asian countries, especially India and China, limit the scope for additional agricultural production.

➤ Therefore, many experts are now focusing on exploring the potential for smaller scale biofuels



# Use of Wastelands and Non-food crops?

	<b>Potential difficulties</b>
<p>1. Use “<b>nonfood</b>” crops like jatropha</p>	<ul style="list-style-type: none"> <li>• Not attractive to farmers: more economic security with <u>multiuse crops</u></li> <li>• Jatropha can grow on wasteland without much water, but then yield will be low &amp; cost high. Better results with irrigation &amp; fertilizer.</li> <li>• If you use irrigation &amp; fertilizer, why not plant food crops?</li> <li>• Jatropha is toxic, and invasive.</li> </ul> <p>=&gt; Doesn't solve the problem.</p>
<p>2. Use “<b>unused wastelands,</b>” “unproductive forest land”</p>	<ul style="list-style-type: none"> <li>• These lands may be <u>actually used</u>, especially by poor people, e.g. for livestock</li> <li>• Land may be providing <u>ecosystem services</u>, not “wasted”</li> <li>• <u>Unclear legal definition</u> of ‘wasteland’ or land tenure systems</li> <li>• Wasteland may <u>not be productive</u></li> </ul>



Jatropha replantation (1 yr), in Uttaranchal, India, Dec. 2008

## Poverty reduction potential ◆ 貧困問題減少の可能性

- Biofuels could increase employment under certain conditions: labor intensive production methods, local production and consumption, use of unused land.
- However:
  - Large scale capital intensive production might not increase employment or wages
  - Potential displacement of poor farmers.
  - Potential tradeoff between production cost & employment



### Mixed evidence on rural potential from our research

- Indonesia: Energy Self Sufficient Village Program has potential; needs more capacity building for farmers.
- India: Jatropha projects not very successful, difficult to attract farmers or workers because unprofitable.
- China: Farmers usually earn more from food crops.





## Considerations for Japan's Biofuel Policy

## ◆ 日本のバイオ燃料 政策に対する考察

- Japan emphasizes development of advanced 2<sup>nd</sup> generation biofuels.
- Particular emphasis on waste materials such as waste cooking oil.
- However, overall potential scale of domestic production is limited.
- Current government target is modest.
- Imports are required to substantially increase scale of biofuel use.

- However, large scale imports could be unsustainable, could worsen deforestation.
  - Brazil may be main potential source; but many countries hope to import from Brazil
- Consider sustainability standards for imports
- Biofuels may make modest contributions to Japan's policy goals of GHG emissions reduction energy security, rural development, and sound material cycle society.

[The main results of the Japan case study are published in the journal *Applied Energy*]

# Potential for 2<sup>nd</sup> Generation Biofuels

- Generally considered more promising than 1<sup>st</sup> generation ones (better theoretical GHG reduction).
- Waiting for technological breakthroughs to increase productivity and reduce costs.
- But 2<sup>nd</sup> generation ones still face potential difficulties.
  - Land and water availability
  - Use of agricultural feedstocks will still raise issues of food fuel conflict and land use change.
  - Use of agriculture waste & crop residues— in many cases this is typically returned to the soil. Their use for biofuels could lead to soil degradation and erosion. Increased fertilizer use could become necessary.
  - Forest litter collection could expose forests to soil degradation & erosion.
  - Other environmental impacts?

# The big picture

## ◆ 全体像

- Overall logic:
  - Biofuels are more expensive than fossil fuels,
  - If biofuels provide benefits to society (such as employment, energy security), government could be justified to pay subsidies
  - So first, it is necessary to know whether expected benefits could be realized
  - Biofuels should be considered along with other energy alternatives, other forms of renewable energy, energy efficiency, public transportation, etc.



# Many uncertainties and concerns about whether expected benefits of biofuels can be realized:

## Energy

- Energy balance uncertain. Depends on specific conditions.
- Resource availability constrains potential

## Economy

- Potential food-fuel conflict: food shortages & high prices
- Biofuels still need government subsidies & support

## Environment

- Greenhouse gas reduction potential depends on specific local conditions

## Resource Availability

- Water: severe shortage
- Land: severe shortage
- Labor: may not be available at the right place, time, wage or skill

# Biofuel sustainability initiatives ◆ バイオ燃料の持続可能性に関するイニシアチブ

*“Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs.”*

– Bruntland Commission

- Initiatives to establish sustainability standards could help resolve questions about biofuels’ environmental and social sustainability.
- **Examples** based on multistakeholder initiatives
  - Roundtable on Sustainable Biofuels (**RSB**)
  - Roundtable on Sustainable Palm Oil (**RSPO**)

## Limitations:

*Difficult for stakeholders to agree on standards.*

- RSB’s “zero draft” still contains broad agenda

*Difficult to attract participation by producers and consumers*

- Transaction costs could be high (e.g.) paperwork; standards could be difficult to meet.
- How to encourage consumers to participate

*Difficult enforcement and monitoring; credibility issues.*

- Participation is voluntary
- Monitoring is costly



# IGES Biofuels Project – Publications on the Web

## ◆ バイオ燃料プロジェクト-ウェブ上の出版物

- Chapter 5, IGES White Paper II “**Prospects and Challenges of Biofuels in Asia: Policy Implications**”  
<http://www.iges.or.jp>



「アジアにおけるバイオ燃料をめぐる政策課題」環境省 持続可能な資源管理に関する公開セミナー  
 IGES 地球環境セミナー2009 第4回  
<http://www.iges.or.jp/jp/news/event/20100311rm/index.html>



- IGES sponsored the “**Research Workshop on Sustainable Biofuel Development in Indonesia: Progress so far and future applied research**” held on 4-5 February 2009 in Jakarta, Indonesia; co-organized by Co-operation for Development-Europe and the Indonesian Renewable Energy Society (METI)  
<http://www.iges.or.jp/en/bf/activity20090204.html>

- IGES sponsored 2 session on Biofuels and Bioenergy at the **2010 International Symposium on a Sustainable Future (focusing on Life Cycle Thinking) (ISSF 2010)** organised by the Indira Gandhi Institute of Development Research (IGIDR) held on 11-13 January in Mumbai, India.  
<http://www.iges.or.jp/en/bf/activity20100111.html>

