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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Mark Elder
Institute for Global Environmental Strategies (IGES)
• 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

- **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

<table>
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<tr>
<th>Country</th>
<th>Blend</th>
<th>Overall</th>
<th>Targets &amp; policies</th>
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</table>
| Indonesia | E5 | • Gov’t views current ambitious strategy as unrealistic; now considering revisions | • National Energy Program, target B20 and E15 in 2025  
• Diesel: subsidies (at same level as fossil fuel) |
| India | E5 | • Gov abandoned recent ambitious but unrealistic new strategy; now revising  
• Several states actively promote biofuels, including pilot projects  
• Focus on use of wastelands, rural development | • Biofuel National Strategy, 2008 / target 20% biodiesel and bioethanol by 2017 (abandoned)  
• Subsidies, tax & price incentives |
| China | E10 | • Initial rapid promotion slowed to minimize food-fuel conflict  
• Still world’s 3rd largest bioethanol producer  
• Focus on alternative feedstocks, 2nd generation | • Biofuel 15% of transport energy by 2020  
• Subsidies, tax & price incentives |
| Japan | E3 Upper limit | • Strategy is modest compared to other countries, but still difficult to achieve  
• Emphasis on 2nd generation, R&D  
• Desire for domestic production but heavy reliance on imports (from Europe & Brazil) | • Plan to replace 500 ML/year of transport petrol with liquid biofuels by 2010  
• Subsidies, pilot projects, tax incentives |
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 2nd generation
- More recognition about limitations of biofuels for energy security, more emphasis on rural development.
Key Issue: Land and Water Availability

- 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?

<table>
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<tr>
<th>Potential difficulties</th>
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<tbody>
<tr>
<td><strong>1. Use “nonfood” crops like jatropha</strong></td>
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<tr>
<td>• Not attractive to farmers: more economic security with multiuse crops</td>
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<tr>
<td>• Jatropha can grow on wasteland without much water, but then yield will be low &amp; cost high. Better results with irrigation &amp; fertilizer.</td>
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<tr>
<td>• If you use irrigation &amp; fertilizer, why not plant food crops?</td>
</tr>
<tr>
<td>• Jatropha is toxic, and invasive. =&gt; Doesn’t solve the problem.</td>
</tr>
</tbody>
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| **2. Use “unused wastelands,” “unproductive forest land”** |
| • These lands may be actually used, especially by poor people, e.g. for livestock |
| • Land may be providing ecosystem services, not “wasted” |
| • Unclear legal definition of ‘wasteland’ or land tenure systems |
| • Wasteland may not be productive |

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**Jatropha replantation (1 yr), in Uttarakhand, 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

- Japan emphasizes development of advanced 2nd 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\textsuperscript{nd} Generation Biofuels

- Generally considered more promising than 1\textsuperscript{st} generation ones (better theoretical GHG reduction).
- Waiting for technological breakthroughs to increase productivity and reduce costs.
- But 2\textsuperscript{nd} 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

• 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

“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

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

- 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)

- 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.

◆ バイオ燃料プロジェクト-ウェブ上の出版物

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