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POLICY BRIEF
Biofuels in Asia: An Analysis of Sustainability Options

BACKGROUND

By promoting small-scale production of biofuels in rural communities rather than large-scale production for transport fuels, national governments and international donors can help bring modern energy to an estimated half a billion people in rural Asia.[1]

Biofuels currently supply less than one percent of transport fuel worldwide and approximately three percent in developing Asia. Large-scale biofuels present a broad range of opportunities, but they also entail significant environmental, social, and economic risks. Feedstock production can compete with food crops for land and water, and feedstock production and utilization often demand a disproportionate amount of subsidies and incentives. Biofuels production can also negatively impact biodiversity and may not deliver cost-effective greenhouse gas (GHG) emissions reductions. Under certain conditions some biofuels may even increase net GHG emissions relative to fossil fuels.

Given the complex challenges presented by biofuels production and use, the US Agency for International Development's Regional Development Mission for Asia (USAID RDMA) sponsored a report to analyze key trends and concerns in Asia,[2] and identify priority actions that USAID and its partners can pursue to address these concerns. The report highlights sustainability options and outlines ways in which official development assistance (ODA) can promote sustainable biofuels in Asia that reduce net GHG emissions, avoid negative impacts on food security and biodiversity, and promote the social welfare of local communities.

KEY FINDINGS

Energy Independence: The present global economic crisis has further eroded the economic viability of large-scale biofuels, and the findings of this report suggest that biofuels will displace a limited amount of fossil fuels within the transport sector in the near- to medium-term—even with substantial government subsidies. In contrast, the study finds that support for ***decentralized biofuels production*** on degraded or underutilized lands[3] holds the potential to sustainably provide energy to roughly half a billion people living in poverty in rural areas.

Climate Change and the Environment: Business-as-usual biofuels production will cause significant harm to the environment and likely do more harm than good with respect to greenhouse gas mitigation. Biofuels plantations must ***avoid converting forests and peatlands at all costs,*** planting instead on degraded or underutilized lands, using high-yielding feedstocks that require minimal inputs.

Food Security: The use of ***non-food feedstocks grown on underutilized land*** for biofuels production and the rapid deployment of second- and third-generation biofuels are crucial to ensuring that food security is not threatened by continued biofuels development.

Social Impacts and Livelihoods: Biofuels initiatives should strengthen the enforcement of ***labor rights,*** protection of ***land rights,*** participatory processes for ***indigenous peoples,*** and implementation of ***biofuels production certification systems***.

1 Asian Development Bank, 2008; World Bank, 2008

2 The report focused on China, India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam.

3 Any future expansion on underutilized lands should be based on a thorough evaluation of competing demands for this land both in terms of expanded food production to meet future demand, and current use of this land by the landless and rural poor for food, fodder and other needs.

ENERGY INDEPENDENCE

Research suggests that the contribution of biofuels to overall transport fuel supply will be limited. Moreover, countries vary in their ability to achieve national biofuels mandates or targets. By 2030, under optimistic assumptions of crop expansion and deployment of second-generation technologies, biofuels will meet no more than an estimated 3–14 percent of the total transport fuel demand in the focus countries.

Smart incentives are needed to promote sustainable biofuels. The use of mandates and targets has led to a rapid scale-up of production, locking in unsustainable, inefficient practices. Instead, incentives should target only sustainably produced biofuels, promote best practices, and facilitate development of more efficient second- and third-generation technologies.

Decentralized production of biofuels offers a promising avenue to enhance the energy independence of Asian nations in a manner that is also commercially viable without large subsidies. Local production and use of biofuels could significantly benefit rural communities by providing access to energy for the millions currently relying on either expensive fossil fuels or traditional biomass for cooking, lighting, and transportation needs.

Box 1. Classification of Biofuels

First-generation biofuels are processed from agricultural crops grown for food and feed, and from non-food oilseed crops such as jatropha and pongamia.

Second-generation biofuels are processed from dedicated energy crops, agricultural and forest wastes, and municipal solid waste to yield ethanol and biodiesel, as well as other fuels.

Third-generation biofuels use microalgae to produce biodiesel.

CLIMATE CHANGE AND THE ENVIRONMENT

The type of land, feedstock, process efficiency, and use of wastes and co-products all directly affect the net GHG and net energy performance of a biofuels production system. The most favorable net energy and GHG savings result from ethanol produced from non-irrigated sugarcane and sweet sorghum, as well as biodiesel produced from oil palm under optimal conditions. In general, high-yielding biofuels feedstocks grown on degraded land consistently have carbon payback periods of only one to two years, whereas feedstocks grown on land converted from primary or secondary forests and peatlands have highly negative GHG impacts—with high carbon debt and long payback periods[4] of up to 1,000-10,000 years or more. The report's findings are consistent with the international consensus on the negative climate change and environmental impacts of large-scale biofuels production.

Biofuels producers can minimize threats to biodiversity by planting on degraded land or existing croplands, and through strategies such as using polycultures that enhance genetic diversity within the production system.

Decentralized biofuels production in Asia can also counteract many of the negative impacts associated

COUNTRY	Biofuels Contribution to Total Transport Fuel Demand (2030)[5]
China	6 %
India	12 %
Indonesia	11 %
Malaysia	3 %
Philippines	8 %
Thailand	14 %
Vietnam	8 %

4 *Biofuel carbon debt* is the amount of CO_2 released from soil and vegetation during the period of time after an area is converted to biofuels crop production. Over time, biofuels from converted land can repay this carbon debt if their production and combustion have net GHG emissions that are less than the life cycle emissions of the fossil fuels they displace.

5 Results of a simulation exercise that combined estimates of available land with various feedstocks and productivity levels, to arrive at estimates of total production of biofuels in Asia. This production was then compared with projected fossil fuel demand for transport to develop estimates of percentage displacement.

with large-scale biofuels production, to the extent that decentralized biofuels production lowers the demand for fertilizers and high-energy inputs, displaces reliance on fossil fuels, and increases vegetation cover if planted on degraded land.

FOOD SECURITY

The demand for first-generation biofuels has diverted food crops to biofuels production, serving as one of the factors that led to high food prices during 2007-2008.[6] Asia's poor are particularly susceptible to high food prices, as food costs comprise up to 60 percent of total household expenditures. Although biofuels can provide jobs and new sources of income to rural communities, the overall negative effect of high food prices may outweigh the benefits of higher returns for farmers' crops. In order to minimize threats to food security, biofuels production should be restricted to underutilized lands not used for food production. Additionally, biofuels should rely on non-food-based feedstocks, such as sweet sorghum, jatropha, and cellulosic ethanol feedstocks.

SOCIAL IMPACTS AND LIVELIHOODS

Positive social impacts are not a guaranteed outcome of the large-scale deployment of biofuels. There is widespread evidence across Asia that the development of biofuels can perpetuate poor labor rights and working conditions, threaten lands used by indigenous and marginalized communities, and precipitate local conflicts over resources. Specific government initiatives are crucial to ensure effective smallholder integration into large-scale production schemes. On the other hand, decentralized biofuels production for local use may deliver greater social benefits, including: improvement of rural livelihoods, support of local industries, and a lower tendency toward exploitation of workers and co-opting of land from indigenous peoples.

FUTURE PRIORITIES FOR BIOFUELS DEVELOPMENT

The report provides a menu of future priority actions to encourage sustainable biofuels in Asia:

Develop a policy framework for sustainable biofuels in Asia. Ongoing biofuels policy development in Asia should be based on a thorough re-evaluation of the effectiveness of traditional policy mechanisms (i.e., mandates and targets) that have been shown to be counterproductive. Support for the development of smart incentives that promote environmental and social sustainability will aid future biofuels production efforts.

Improve land resource planning maps. Current estimates of land availability for biofuels expansion is based on gross-scale national surveys that often do not include information on land quality, previously existing land use, local populations, or conservation value. Gathering information on these elements at a local level would better inform decisions on sustainable biofuels production programs.

Box 2. Promising Feedstocks that Do Not Compete with Food

Sweet sorghum and jatropha have shown promise as ethanol and biodiesel feedstocks, respectively. Both feedstocks may be ideal because they provide good net energy balances and net GHG savings; have low water requirements; and are not in high demand in the global food market. Jatropha, in particular, grown on a small scale in decentralized systems on degraded lands can help with soil and water conservation, reclamation, and erosion control, and can be used for fences, firewood, green manure, lighting fuel, soap, insecticides, and medicine. Preliminary indications suggest that these crops may grow well on degraded land, but there is only limited experience with growing the crops for biofuels production. Trials show a wide range of yields, and more research is needed on crop agronomy and optimal growing conditions.

6 Although Asia was less affected by food price increases than other regions.

PHOTO: USAID/EGAT

Women in India operating a generator powered by pongamia oil

Support scale-up and regional replication of sustainable, decentralized biofuels projects. Development organizations can offer technical assistance to foster decentralized biofuels projects that take environmental, economic, technical, and social factors and needs into consideration, and improve rural access to energy resources.

Support development of regional environmental standards and certification schemes. ODA can support the development and adoption of national and regional standards and protocols within Asia that are consistent with emerging international standards, performance guidelines, and certification schemes, such as the Roundtable on Sustainable Palm Oil (RSPO) and the Roundtable on Sustainable Biofuels (RSB).

Support agronomy research and technology transfer. The rate at which promising crops and technologies are commercialized will depend on how quickly Asian countries can optimize production systems to maximize yields under local growing conditions. US-to-Asia and Asia-to-Asia research partnerships and technology transfer conducted in partnership with regional stakeholders would accelerate this process.

Support technology transfer for cellulosic ethanol. Given the advantages of second- and third-generation technologies over first-generation biofuels, current research, development, demonstration, and deployment efforts under way in the US could be transferred to Asia through public-private partnerships, demonstration projects, and technology transfer initiatives.

Provide technical assistance on life cycle analyses (LCAs). LCAs have become an important tool to evaluate biofuels feedstocks and production systems. USAID can support capacity building for Asian stakeholders to conduct LCAs for various Asian feedstocks and growing conditions, in order to help policymakers, investors, and project developers make informed decisions that will facilitate the scaling up of biofuels production in a sustainable manner.

Box 3. Conditions for Sustainable Production of Biofuels

- Non-irrigated feedstock production
- Low-to-no synthetic fertilizer
- Full utilization of co-products and wastes
- Biofuels use in production process
- Planted on degraded or underutilized land
- Grown in polycultures
- Avoid converting native vegetation