In focus

- Indonesia is a densely populated country (237.4 million people); it has 1,811,569 km² land, 93,000 km² water, and an annual gross domestic product of 1,105 billion dollars;
- Indonesia is the largest consumers market in Southeast Asia;
- Indonesia is member of the G-20 and has a growing and solid industry, despite the global economic crisis;
- Its sustained economic growth of 6% has put pressure on the energy offer and on environmental issues;
- Implementing sustainable bioenergy solutions can overcome bottlenecks to economic growth, while mitigating climate change impacts;
- Large agricultural potential, coupled with skilled local workers supports the development of bioenergy.

The Netherlands is an important partner of Indonesia. NL Agency Sustainable Biomass Programmes and NL Agency International EVD support entrepreneurs deploying sustainable bioenergy projects.

Potential markets: Key facts

Land use (Million Has):
Agricultural land is highly fertile. Most of the land is forestland; there is a loss of 1.8% of forest each year.

Production biofuels
Blending mandates on transport fuels drive the market for biofuels (E15 and B20 by 2025). The country has a large potential for the use of alternative biofuels crops and for used cooking oil and animal fats for biodiesel production. Sustainable use of land remains a major challenge.

Production bioenergy
There is an untapped potential for bioenergy using dedicated crops and residual flows such as forestry and agricultural residues, organic municipal solid organic waste, offal, sewage sludge, and landfill gas.
Key developments in Indonesia

Bioenergy projects are characterized by 1) feedstock; 2) logistics and 3) conversion. Identification of their strengths and limitations is crucial for success.

1 Feedstock production

Biomass from forestry
While the country has abundant forests, there is the risk of harming biodiversity-rich resources. Sustainable forestry feedstock in Indonesia comes from rubber wood, woody residues from logging or wood industry waste. Studies indicate a potential for collected annual forest biomass of 135 dry million tonnes.

<table>
<thead>
<tr>
<th>Forestry residue*</th>
<th>Amount (million tonnes/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year: 2007-2009*</td>
<td></td>
</tr>
<tr>
<td>Rubber wood</td>
<td>2.8</td>
</tr>
<tr>
<td>Wood Waste</td>
<td>8.3</td>
</tr>
</tbody>
</table>

* Based on literature review of potential availability

Biomass from Agriculture
Indonesia is the world’s largest producer of crude palm oil – an important feedstock for biodiesel – and the third largest producer of rice. Other major agricultural products are: cassava (tapioca), groundnuts, cocoa, coffee, and copra.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield (ton/ha)</th>
<th>Planted area (million ha)</th>
<th>Production (mio tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm oil fruit</td>
<td>17.2</td>
<td>5.0</td>
<td>86.0</td>
</tr>
<tr>
<td>Rice, paddy</td>
<td>5.0</td>
<td>13.2</td>
<td>66.4</td>
</tr>
<tr>
<td>Cassava</td>
<td>20.2</td>
<td>1.18</td>
<td>23.9</td>
</tr>
</tbody>
</table>

* Based on literature review of potential availability

Relevant trends and theoretical potential
The large potential of biomass resources offers sustainable entrepreneurs new business opportunities:

- Forestry residues provide a source for bioenergy production that is still underexploited;
- Large amounts of agricultural residues (i.e. empty stalks, fibres or bagasse) offer power and heat production opportunities via direct combustion or co-digestion biogas plants;
- A very large potential for aquatic biomass exists; both on-land and at sea;
- Estimates on the availability of marginal or degraded land vary greatly; at least a considerable area could be available for energy crop production.

2 Logistics

Infrastructure is a major consideration when choosing production locations. Important obstacles to conducting business and importing or exporting biomass are:

- Transport of equipment and products from and to minor islands;
- Transport from field to main gathering points or end-user facilities;
- Transport from gathering points to distribution ports;
- Fuel shortages are common outside Java, even in major towns on Kalimantan and Sulawesi.

Sea transport
Each major island has at least one significant port from which goods can be imported/exported from/to other countries; however shipping between islands can be time-consuming, sometimes only small vessels are used.

Air transport
There is an extensive air transport network with several airlines, but traffic is centred on Jakarta with few direct flights between other islands. There are 171 airports with paved runways (27 of them with international status), and 513 airports with unpaved runways.

Road and rail transport
Java has a well-developed road and rail system; however the quality of infrastructure on other islands varies widely. Sumatra and Sulawesi have roads often in disrepair. Roads outside the main network are not surfaced, making land transport often slow and expensive. Sumatra has few rail lines.
3 Conversion

A wide range of conversion technologies is used for bioenergy production in the country. Most projects are still in a start-up phase, at different levels of commercialization and deployment.

Aquatic biomass for global sustainable energy production - Maris Projects B.V. (supported by NL Agency)

Ruben Maris explains:
In this project, palm waste water (POME) is converted into aquatic biomass (algae). These algae take nutrients like nitrogen, phosphate and potassium from the water. Research is conducted to learn how much algae can be produced, at what quality, and on which surface. How much energy can be produced depends on the algae species and the growing conditions. Algae can also be produced for feeding supplements. It is planned to work also with other waste water streams. This project has motivated Maris Projects to look for more bioenergy business opportunities in Indonesia along with their local partners.

Why Indonesia?
“We chose Indonesia for various reasons. The first reason is the stable climate, which is almost every day sunny and always 30 - 35 °C. Because Indonesia is on the equator, they have the sunniest hours, while it is not too hot. The second reason is that Indonesia has a lot of water. Algae can grow on salt and sweet water. We can grow algae in salt water, so no forest land needs to be cut. The third reason is that Indonesia is a developing country where waste water treatment is not sufficient. In Indonesia there is also the palm industry, which is one of the most water polluting industries. We had positive surprises as well; we have faced zero corruption, and the government is giving us 100% support.”

What are the lessons learnt?
“The most important lesson is to always find a local partner. This makes compliance with law and regulation easier. It will also save you costs on purchasing etc. In Indonesia, everyone wants to profit from you. By having a local partner, it will cost less. Working in Indonesia is different than working in Europe. You should always respect the way of working of the foreign country. Don’t think they work as you, they will do it their own way.”
Business opportunities and experiences

Investment climate

The solid economic growth of Indonesia attracts foreign investments. Reception of Foreign Direct Investment (FDI) is expected to continue growing in mining, energy supply, communication, infrastructure, and cement plants. Bioenergy projects may benefit from government subsidies and credits that most of the times require local partnerships. Business start-up is better facilitated in the last years, though bureaucracy remains an important obstacle. The main concern with long-term investment is weak infrastructure conditions and the fear of inflation return.

Triggers for investment

• Indonesia has a wealth of natural resources;
• The country has a large, young labour force with a fairly good level of literacy;
• The potential of the bioenergy sector is large and in its early development;
• Opportunities exist in R&D, development of agricultural projects, deployment of (new) technologies and in providing specific expertise.

Things to remember

• Define the project’s competitive edge;
• Understand competing price mechanisms;
• Be aware of the stretchability in time (be flexible);
• Obtain a full understanding of legal procedures and policies;
• Build up a network of contacts and understand your partners’ culture and position;
• Start your business in Indonesia, not from a distance.

Entrepreneurship in Indonesia

Nine sustainable biomass projects are supported by NL Agency through the Sustainable Biomass Import programme (DBI) and the Global Sustainable Biomass programme (DBM):

• Pilot project: Rice husk as feedstock for power generation;
• Aquatic biomass for sustainable energy production: applicability of algae treatment on POME;
• Pilot project: Capturing methane emissions from palm oil mill effluent for fossil fuel replacement in power generation in Palembang;
• Certification system addressing indirect impacts of biofuels such as displacement of food/feed production;
• Development and monitoring of sustainable candlenut and castor biomass supply chains in Lombok island;
• Improving the social-economic impact of biomass production for local communities;
• Land use planning to promote sustainable biofuel production in West Kalimantan;
• Sustainable biomass production from sugar palm for local use and for export to other regions using village hubs;
• Pilot project: Development of sustainable and commercially feasible bioethanol from sweet sorghum.

Relevant other contacts

Useful contacts for entering the Indonesian bioenergy market:

• The Indonesian Benelux Chamber of Commerce: http://www.ina.or.id/
• Dutch embassy in Indonesia: http://indonesia.nlembassy.org/
• Indonesian-Dutch chamber of commerce: http://www.ina.or.id/

Relevant ministries and government agencies:

• Ministry of Energy and Mineral Resources Indonesia: http://www.esdm.go.id/
• Ministry of Forestry: http://www.dephut.go.id
• Ministry of Agriculture: http://www.deptan.go.id
• Ministry of Trade: http://www.kemendag.go.id/
• The Ministry of Economic Affairs, Agriculture and Innovation: www.agentschapnl.nl/

NGOs and others involved in NL Agency’s sustainable bioenergy programmes:

• Both Ends: http://www.bothends.org/
• Fauna and Flora International: http://www.fauna-flora.org/
• Netherlands Centre for Indigenous Peoples: http://www.indigenouspeoples.nl/
• Oxfam Novib: http://www.oxfamnovib.nl/
• World Wildlife Fund Indonesia: http://www.wwf.or.id/

Other relevant international organizations or Funds:

• IEA: http://www.iea.org/country/n_country.asp?COUNTRY_CODE=ID
• USAID ECO-Asia Clean Development and Climate Program: http://usaid.eco-asia.org/programs/cdcp/
• Asian Development Bank: www.adb.org
Relevant Indonesian policies

Energy and climate
• Reduction of GHG emissions by 26% in 2020
• Ambitions for growth in energy resources diversification; increase in renewable resources share
• Energy access in 2020: 90% (currently two thirds of population has energy access)
• Biofuels meet at least 5% of energy use by 2025

Transport
• Ambitious growth for biofuels from 482 in 2010 to 14819 in 2025 (in million litre)
• E10 and B15 by 2015
• E15 and B20 by 2025
• Standard for fuels

Agriculture
• Government supported programs granting credit access at preferential rates to develop plantations
• Private companies usually are allowed to act as partners to local farmers, applying for credit and then channelling those funds to farmer group

Public support for project development and bioenergy

Supporting sustainable biomass Indonesia
The Indonesia Biofuel Program from the Ministry of Energy and Mineral Resources offers:
- VAT exemption;
- Investment tax incentives;
- Direct subsidy on retail price for transportation sector;
- Interest rate subsidy for biofuel feedstock plantations, and
- Simplification of the licence procedures.
Other support instruments are the Clean Technology Fund, the Indonesia Climate Change Trust Fund, the Income Tax Facility, and the recently established REDD+ partnership with Norway.

Supporting sustainable biomass Netherlands
NL Agency has a vast network of contacts and can provide information based on many years of experience in supporting projects and operationalising government policies on biomass and energy. It offers entrepreneurs support and information. The Bilateral Energy Cooperation Indonesia Netherlands (BECIN) supports business development in renewable energy, for example by publishing the brochure on Financial instruments for cooperation between the Netherlands and Indonesia in the energy sector: http://bit.ly/wKTyvs

Role of innovation, science and technology

Key universities in Indonesia and cooperation programmes
• The Indonesia Oil Palm Research Institute (IOPRI) supports state owned plantation companies: http://www.iopri.org/
• The Agency for the Assessment and Application of Technology (BPPT) supports research in biofuels: www.bppt.go.id/
• The Dutch – Indonesian scientific cooperation programme “Agriculture beyond Food” explores the potential of biomass: www.knaw.nl
• BECIN supports capacity building at Indonesian Universities: http://bit.ly/x5SV84

Universities involved in NL Agency’s sustainable bioenergy programmes
• Centre for International Cooperation (CIS) – VU University: http://www.cis.vu.nl
• Institut Teknologi Minaesa (ITM) Tomohon: http://www.itm-t.ac.id/
• KU Leuven: http://www.kuleuven.be
• University of Amsterdam: http://www/english.uva.nl/
• University of Diponegoro: http://www.undip.ac.id/
Other research organizations involved are the World Agroforestry Centre (ICRAF-SEA), Stichting Dienst Landbouwkundig Onderzoek (DLO) and the Amsterdam Institute for Social Science Research.

Biomass and sustainability

Indonesia has a wealth of resources but faces various threats to sustainability. ‘New lands’ to bioenergy production, for instance, presents a serious threat to biodiversity and may harm the position of small landholders, landless and indigenous people.

To take into consideration when developing a sustainable project:
- Interaction between food supply and energy;
- Scale-up effects;
- Price mechanisms;
- Government policies;
- Knowledge of local network and communities;
- New crops;
- Resource competition.

Initiatives:
Indonesia’s Timber Legality Assurance standard (SVLK) is compatible with the EU Timber Regulation. The country aims to develop criteria and indicators for the sustainability of biofuels. Most of the large state owned companies have joined the Round Table on Sustainable Palm Oil (RSPO).
Pilot project bioethanol from sweet sorghum SINTESA Group  
(supported by NL Agency)

Suryo Murti explains:  
Four high yielding sweet sorghum varieties were grown as feedstock for bioethanol processing in a 50 Ha pilot. All the varieties produced 150 to 200 tonnes of stalk plus 3 to 4 tonnes grains per hectare. When processed, stalk yields 50 to 55 liters of hydrous bio ethanol (90% purity) from juice with sugar content of 15% to 18% or 7,500 to 11,000 litres per hectare. Cost of production is 0.18 USD/tonne of stalk, while cost of processing stalk to bioethanol is USD 0.25 per harvest.

Why Indonesia?  
“The project started in Indonesia to support the government biofuels mandate. The soil and agro-climatic environment in Indonesia is highly suitable for growing sweet sorghum”.

What are the lessons learnt?  
Socialization of the project should happen at all stages of its implementation by involving local governments and surrounding communities. In the first phase of the pilot project (September 2009 to March 2011), only one fifth of the target was reached due to lack of socialization of the project. This was corrected in the second phase (June 2011 to date). National product market availability is important for a domestic producer to have a larger market for its bioethanol products.

NL Agency offers support

• Knowledge centre
Extensive knowledge and information is available to answer your questions on bioenergy, Indonesia and related topics.
• Support
Various programmes have been developed to support innovative pilot projects, joint-investments, and transfer of technology, knowledge and skills in social and economic sectors.
• Network
Matchmaking is provided between new initiatives and private businesses in Indonesia; establishing links with companies, and promoting networks to exchange knowledge and information.


The Global Sustainable Biomass Fund is commissioned by the Ministry of Foreign Affairs and implemented by NL Agency.

Although this report has been put together with the greatest possible care, NL Agency does not accept liability for possible errors.