Bioenergy Potential Development from Agricultural Sector

Indonesia Agency for Agriculture Research and Development (IAARD)
Bioenergy Week Medan 24-29 May 2015
Task of Ministry of Agriculture based on Presidential Instruction No. 1/2006

- Provide plant material of biofuel producing crops
- Extension services on biofuels development program
- Provide seed of biofuel producing crops
- Integration activities of upstream and downstream aspect of biofuel dev. program
Short and Medium Term Program on Providing Biofuel Feedstock

- Intensification of Existing Crops
- Extentification of biofuel producing crops
- Land availability

FEEDSTOCK
Total agricultural land is 70 million ha, 45 million ha effectively used.

8.1 million ha rice field and 14.6 million ha dry land are dedicated to food crops.

Conversion and degradation of rice field and dry land tend to increase yearly.
87.8% of irrigated land (3.6 million ha) located in Java.

Agricultural land in Java more productive than in other islands:
- Higher soil fertility (physico-chemical), supported with suitable climate.
- Food crop productivity higher (>10-35%) than other islands.

Significant (>55%) contribution to national food security:
- Rice (65.9 million ton): 54.6%
- Corn (17.9 million ton): 53.5%
- Soybean (905 thousand ton): 67.5%
- Sugar (2.69 million ton): 54.4%
- Cow (392 million head): 51.3%
DEVELOPMENT OF DRY LAND AREA

In 2025: 7.3 million land needed to support agricultural development program
- Rice field: 1.4 million ha
- Soybean: 2 million ha
- Corn: 1.3 million ha
- Sugarcane and horticulture: 2.6 million ha
- Most of the untilized land are dry land and degraded land

Development and Optimizing of Dry Land through Intensification and Extentisication
# Potential Land

(Based on Agro-ecosystem)

<table>
<thead>
<tr>
<th>Island</th>
<th>Swampy Land (000 ha)</th>
<th>Non Swampy Land (000 ha)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wetland (rice field)</td>
<td>Dryland annual crops</td>
<td>Dryland peren. Crops</td>
</tr>
<tr>
<td>Java</td>
<td>57</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Bali + NT</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kalimantan</td>
<td>1.905</td>
<td>0</td>
<td>1.413</td>
</tr>
<tr>
<td>Sulawesi</td>
<td>235</td>
<td>105</td>
<td>18</td>
</tr>
<tr>
<td>Maluku+ Papua</td>
<td>115</td>
<td>0</td>
<td>718</td>
</tr>
</tbody>
</table>
## Distribution of available land

(Potential for Extensification)

<table>
<thead>
<tr>
<th>Island/Province</th>
<th>Seasonal Wetland</th>
<th>Seasonal Dry Land</th>
<th>Perennial/Plantation Dry Land</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Swamp</td>
<td>Non swamp</td>
<td>Total</td>
<td>Swamp</td>
</tr>
<tr>
<td>Sumatra</td>
<td>355</td>
<td>606</td>
<td>961</td>
<td>1.312</td>
</tr>
<tr>
<td>Java</td>
<td>0</td>
<td>14</td>
<td>14</td>
<td>41</td>
</tr>
<tr>
<td>Bali &amp; NT</td>
<td>0</td>
<td>49</td>
<td>49</td>
<td>138</td>
</tr>
<tr>
<td>Kalimantan</td>
<td>730</td>
<td>666</td>
<td>1.396</td>
<td>3.639</td>
</tr>
<tr>
<td>Sulawesi</td>
<td>0</td>
<td>423</td>
<td>423</td>
<td>215</td>
</tr>
<tr>
<td>Papua</td>
<td>1.893</td>
<td>3.294</td>
<td>5.187</td>
<td>1.689</td>
</tr>
<tr>
<td>Maluku</td>
<td>0</td>
<td>246</td>
<td>246</td>
<td>50</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2.978</td>
<td>5.298</td>
<td>8.276</td>
<td>7.084</td>
</tr>
</tbody>
</table>
Agriculture Landused

• Biopysically suitable land for agriculture including bioenergy crops is about 76.4 mill ha:
  ➢ Agriculture 71.2 mill ha
  ➢ Non agric/other use 5.2 mill ha

• Agriculture land 71,20 juta ha:
  ➢ Energy crops: oil palm 10.0 juta ha, coconut 3,80 mill ha, and other

• Part of these land mentioned above have not been identified yet, either the owner, sertificate and also other status (state owned, private, ulayat, etc)
Unutilized Land

• Base on the map of land suitability and land use, there are really suitable land for bioenergy crops, it is about 22.4 mill ha

  ➢ 7.1 mill ha suitable for cash crops i.e. sorghum, cassava, corn, sugarcane)
  ➢ 15.3 mill ha suitable for annual crops i.e. candle nut, jatropha, curcas, coconut, aren)

• These land remain as tertiary forest, savana and grasses land
Existing crops utilization for supporting food security

- Paddy dedicated for food
- Cassava dedicated for food/feed
- Corn dedicated for food
- Coconot dedicated for food
- Sugarcane dedicated for food
- Oil Palm food and biofuel (manageable for achieving national target)

... sugarcane dedicated area for production either bioetanol or sugar is needed ...

... feedstock should be from other crops
Available Technology in Ministry of Agriculture

- High yielding variety of energy crops (oilpalm, candle nut, jatropha curcas)
- Pilot scale technology for utilizing biomass/lignocelullosic are ready for upscaling
- Technology Innovation and Guidance Book of Good Agriculture Practices
- Land suitability map of energy crops
Kemiri Sunan (cundle nut)

- Non-adible feedstock
- Production starting from year 4 and will be yielding around 12-15 ton seed/ha (6-8 ton biodiesel/ha/year)
- Population: 150 trees/ha
- Food crop can be intercropped before shading (during first of 3-4 years)
- Cernel rendemen: crude oil (40-50%) → biodiesel (88-92%)
- Tolerance for the infertile soil

Sumber: Puslitbangbun, 2013
Pertumbuhan Kemiri Sunan
Di Lahan Bekas Tambang Timah (ex mining soil) di Bangka

Sumber: Puslitbangbun, 2014
KEMIRI SUNAN umur 13 bulan di lahan kurang subur Red Yellow PODZOLIK soil

Sumber: Puslitbangbun, 2014
Map of Suitable Land for Sugarcane and Jatropha
Map of Suitable Land for Bioenergy Crops in Indonesia
Map of Suitable Land for Oil Palm in Indonesia
Closing Remarks

1. Agriculture sector potentially can produce bioenergy feedstock, but the utilization of suitable land have to be managed well.

2. Declining the acreage of agriculture land will be affecting agriculture production, so Indonesia need to have extensification program. Therefore should not convert food crops or cash crops from productive land to bioenergy crops use
Closing Remarks

3. Dedicated area is needed, specially for bioetanol production from sugarcane or cassava. Unused land can be allocated but based on map of suitable and

4. As long as for the domestic use, agriculture biomass is very prospective for biofuel through the second generation biofuel technology. This technology is also very important will be useful for environment and climate change consideration
thank you