Leading the Way for Climate-Smart Agriculture through Machinery and Practices in Indonesia

Presentation by

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Area: 5,193,250 km²
- Land: 1,919,440 km²
- Water: 3,273,810 km²

Island: 17,508

Population: 253,000,000

Agricultural land: 70.2 million ha
- Wetland paddy: 8.11 million ha
- Dry Land: 11.87 million ha
- Plantation: 18.5 million ha
- Meadow/pastures: 2.4 million ha
- Yard: 5.4 million ha
- Ponds: 0.8 million ha
- Timber Plants: 9.3 million ha
- Sub optimal lands: 11.3 million ha
### MAJOR AGRICULTURAL PRODUCTS (2014)

- The rainy season: October to April
- The dry season: April to October
- Land holding: 0.3 - 0.5 ha/farmer

<table>
<thead>
<tr>
<th>No.</th>
<th>Commodity</th>
<th>Harvested Area (ha)</th>
<th>Productivity (Ton/ha)</th>
<th>Production (Ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Paddy</td>
<td>13.569.941</td>
<td>5.15</td>
<td>69.870.950</td>
</tr>
<tr>
<td>2</td>
<td>Corn</td>
<td>3.786.376</td>
<td>4.89</td>
<td>18.548.872</td>
</tr>
<tr>
<td>3</td>
<td>Soybean</td>
<td>601.237</td>
<td>1.48</td>
<td>892.602</td>
</tr>
<tr>
<td>4</td>
<td>Ground nut</td>
<td>501.142</td>
<td>1.32</td>
<td>664.003</td>
</tr>
<tr>
<td>5</td>
<td>Green beans</td>
<td>180.055</td>
<td>1.17</td>
<td>210.819</td>
</tr>
<tr>
<td>6</td>
<td>Cassava</td>
<td>1.149.208</td>
<td>22.99</td>
<td>26.421.770</td>
</tr>
<tr>
<td>7</td>
<td>Sweet potato</td>
<td>156.862</td>
<td>15.07</td>
<td>2.363.568</td>
</tr>
</tbody>
</table>
### NUMBER OF AGRICULTURAL MACHINERY IN INDONESIA

<table>
<thead>
<tr>
<th>NO</th>
<th>AGRICULTURAL MACHINERY</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 Wheel tractor</td>
<td>216 174</td>
</tr>
<tr>
<td>2</td>
<td>4 Wheel tractor</td>
<td>3 887</td>
</tr>
<tr>
<td>3</td>
<td>Irrigation pump</td>
<td>148 275</td>
</tr>
<tr>
<td>4</td>
<td>Rice transplanter</td>
<td>5 617</td>
</tr>
<tr>
<td>5</td>
<td>Combine harvester</td>
<td>1 090</td>
</tr>
<tr>
<td>6</td>
<td>Thresher</td>
<td>70 678</td>
</tr>
<tr>
<td>7</td>
<td>Grain dryer</td>
<td>2 323</td>
</tr>
</tbody>
</table>

Source: Sudaryanto, 2016
TARGET OF INDONESIA AGRICULTURE DEVELOPMENT

- Sustainable Food Sufficiency & Security
- Increasing Food Diversification
- Increase added value, competitiveness and export
- Increasing farmer welfare
PROBLEMS IN ACHIEVING SUSTAINABLE FOOD SELF SUFFICIENCY

**LAND**
- High land conversion rate (+/-60 000ha/year)
- Small land holding (0.3 ha/farmer)

**INFRASTRUCTURE**
- Poor maintenance of irrigation & drainage facilities (48% was not function properly)
- High cost of food production

**AGRICULTURE**
- Seed and fertilizer production and distribution system does not work properly
- Limited number and low utilization of Farm machinery

**INPUT**
- Flood, drought, pest & disease explosion

**CLIMATE CHANGE & ENVIRONMENT**
- Lack of agricultural labor (5 mill agricl’ labor shifted to non agricultural job within 10 year) → high labor cost, low crop index
- High losses, Low product quality

**COMPETITIVENES**

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1. Decreasing capacity of water in some large reservoirs: (5.7 → 4.9 mill m3/year), Citarum, Gajah Mungkur & Kedung Ombo

2. Delay planting season → decreases rice production in West Java and Central Java 6.5%, Bali 11%

3. Decreases planting area & Increased land area prone to drought (0.03 to 3.1%) / flood (1.4 to 7.8%) & inundated area (0.8 → 13.8%)

4. Disorderly/failure of flowering system → Reduce production of fruit & estate crop: 5-8% → more than 20%

5. In 2015 delay of rainy season by more than 1 month and in 2016 rainy season start 2 month earlier → flood
PROGRAM PRIORITY OF MOA TO ACHIEVE SUSTAINABLE RICE SELF SUFFICIENCY

IRRIGATION
- Improvement of tertiary cannal
- Maintenance of main Irrigation cannal

SEED
- Supply of seed to the farmer on time
- Support seed industry

AGRICL’ MACHINERY
- Farm machinery grand to overcome lack of labor, increasing cropping index and reducing post harvest losses, reducing labor cost
- Optimization of existing farm machinery.

EXTENSION
- Farmer group
- Custom hiring
- Water user association

FERTILIZER
- Supply of fertilizer to the farmer on time
- Improvement of distribution system
- Utilization organik fertilizer

SUSTAINABLE FOOD SELF SUFFICIENCY
• R&D to develop New superior variety of crops and cattle, Pest & disease control;

• R&D to develop Agricultural machinery specific location, Land, water and fertilizer management, Improve crops management through “JAJAR LEGOWO SYSTEM”, Post harvest handling and processing

• Agricultural planning and management based on IT
  • Crop calendar
  • Dynamic standing crops map
  • Expert system for pest and disease control
  • Expert system for farm machinery distribution
“JAJAR LEGOWO”
TRANSPLANTER 
FOR PADDY

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**BEST PRACTICES OF DEVELOPMENT AND UTILIZATION OF AGRICULTURAL MACHNERY**

- **JAJAR LEGOWO TRANSPLANTER**
  - Designed and developed in 2013 - 2014

- 1000 unit was produced and marketed in 2015
- 2000 unit was produced and marketed in 2016

Using combination of “Jajar Legowo Super technique and Transplanter, Rice productivity has increase from 6 ton/ha to 9.5 ton/ha of dried paddy in Central Jawa (2016)
SEEDLING PREPARATION FOR JAJAR LEGOWO SYSTEM

• Using seedling trays
• Amount of seed 30% higher than existing system
Paddy seedling practices for Jajar Legowo 
Transplanter at corporate farming in Sukoharjo- 
Central Jawa
Paddy seedling practices for Jajar Legowo Transplanter in East Kotawaringin, Central Kalimantan
TRANSPLANTER AND JAJAR LEGOWO TECHNIQUE

- Increase the number of crops by 30%
- Increase Rice Yield 20-30%
- Machine capacity: 6 - 7 h/ha
- 7 Indonesian Agricultural Machinery Industries has produced and marketed Transplanter Jajar Legowo
MINI COMBINE HARVESTER

- Reduced harvesting cost 30%
- Grain losses 1.87%
- Capacity 7 - 9 h/ha
- 5 Indonesian agricultural machinery industries has produced and marketing mini combine harvester
MEDIUM ZSIZE COMBINE HARVESTER

- Reduced harvesting cost 30%
- Grain losses < 2%
- Capacity 4-6 h/ha
- 4 Indonesian agricultural machinery industries has produced and marketing mini combine harvester
R&D ON AGRICULTURAL MACHNERY FOR MAIZE

- MAIZE AND PADDY COMBINE HARVESTER
- RUBBER TRACK SHOE ROTAVATOR CUM DECOMPOSER
## To Increase Cropping Intensity, Reduce Losses and Cost, in 2015 MOA of Indonesia Has Granted Number of Agricultural Machinery to the Farmer Group

<table>
<thead>
<tr>
<th>NO</th>
<th>Agricultural Machinery</th>
<th>Number</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 Wheel Tractor</td>
<td>26 100</td>
<td>Unit</td>
</tr>
<tr>
<td>2</td>
<td>4 Wheel Tractor</td>
<td>1 000</td>
<td>Unit</td>
</tr>
<tr>
<td>3</td>
<td>Irrigation Pump</td>
<td>8 178</td>
<td>Unit</td>
</tr>
<tr>
<td>4</td>
<td>Rice Transplanter</td>
<td>5 000</td>
<td>Unit</td>
</tr>
<tr>
<td>5</td>
<td>Chopper</td>
<td>697</td>
<td>Unit</td>
</tr>
</tbody>
</table>
THE USE OF AGRICULTURAL MACHINERY HAS SPEED UP FIELD ACTIVITY IN MANY PROVINCES IN INDONESIA

<table>
<thead>
<tr>
<th>Field activity</th>
<th>Manual (man days)</th>
<th>Full Mechanized (day)</th>
<th>Time Reduction (man days)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land preparation</td>
<td>20</td>
<td>3</td>
<td>-17</td>
<td>-85,0</td>
</tr>
<tr>
<td>Seedling and planting</td>
<td>19</td>
<td>7,5</td>
<td>-11,5</td>
<td>-60,5</td>
</tr>
<tr>
<td>Weeding</td>
<td>15</td>
<td>2</td>
<td>-13</td>
<td>-86,7</td>
</tr>
<tr>
<td>Harvesting</td>
<td>40</td>
<td>7,5</td>
<td>-32,5</td>
<td>-81,3</td>
</tr>
<tr>
<td>Total</td>
<td>94</td>
<td>20</td>
<td>-74</td>
<td>-78,4</td>
</tr>
</tbody>
</table>
## The Use of Agricultural Machinery Has Reduce Labor Cost

<table>
<thead>
<tr>
<th>Activity</th>
<th>Manual (Rp/ha)</th>
<th>Full Mecanized (Rp/ha)</th>
<th>Cost reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rp</td>
</tr>
<tr>
<td>• Land preparation</td>
<td>1.600.000</td>
<td>1.200.000</td>
<td>-400.000</td>
</tr>
<tr>
<td>• Seedling and planting</td>
<td>1.720.000</td>
<td>1.100.000</td>
<td>-620.000</td>
</tr>
<tr>
<td>• Weeding</td>
<td>1.200.000</td>
<td>510.000</td>
<td>-690.000</td>
</tr>
<tr>
<td>• Harvesting</td>
<td>2.857.125</td>
<td>2.285.700</td>
<td>-571.425</td>
</tr>
<tr>
<td>Total</td>
<td>7.377.125</td>
<td>5.095.700</td>
<td>-2.281.425</td>
</tr>
</tbody>
</table>
MILLING RECOVERY OF SMALL RMP

Milling Recovery
56% - 61%
&
Broken 25% - 30%

Milling Recovery
66% - 67%
&
Broken 15% - 20%

Husk

Milled Rice

Brown Rice

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Thank you.

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