INDONESIA SUSTAINABLE AGRICULTURAL MECHANIZATION STRATEGY TO SUPPORT RICE SELF SUFFICIENCY, SURPLUS AND EXPORT

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OUTLINE

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2. STRATEGY TO ACHIEVE THE SUSTAINABLE RICE SELF SUFFICIENCY AND EXPORT
3. DEVELOPMENT OF SUSTAINABLE AGRICULTURAL MECHANIZATION TO INCREASE RICE PRODUCTION, SURPLUS AND EXPORT
4. SOME PROBLEMS IN DEVELOPING SUSTAINABLE AGRICULTURAL MECHANIZATION IN INDONESIA
5. STRATEGY FOR DEVELOPMENT OF SUSTAINABLE AGRICULTURAL MECHANIZATION TO SUPPORT RICE PRODUCTION AND SELF SUFFICIENCY AND EXPORT
6. CLOSURE
INDONESIA
Tolat Area : 5,193,250 km²
  - Land : 1,919,440 km²
  - Water : 3,273,810 km²
Number of Island : 17,508
Total Population : 253 Million
STATUS OF INDONESIAN AGRICULTURE 2016

Population : 253 million people
Population growth : 1.13 % per annum.
Stapple food : Rice
Rice consumption : 33.84 million ton.
Rice production : 47.5 mill ton
Total Indonesian farmer : 37 % of the total population
The total agricultural area : 20 million ha
  Wet land paddy area : 8.11 million ha,
  Upland and garden : 11.87 million ha
Average land holding : 0.3 ha per farmer.
The Target of National Agricultural Development

a. Increasing food production, surplus and export of food and agricultural product.

b. Increasing Food diversification

c. Increasing added value, competitiveness of agricultural product

d. Providing raw material for bio industry and bio energy

e. Increasing farmer income and welfare
Problems in Achieving the Target:

a) High agricultural land conversion rate,
b) Decreasing of agricultural labour,
c) Climate change (cased: flood, drought and pest explosion)
d) Damage of irrigation canal

e) High post harvest losses,
f) Some existing agricultural machinery does not match with the condition of agro-ecosystem, social and cultural.
g) Low skill and knowledge of the farmer to manage and operate agricultural machinery
2. STRATEGY TO ACHIEVE SUSTAINABLE RICE SELF SUFFICIENCY AND EXPORT

- IMPROVEMENT AND BUILD NEW IRRIGATION FACILITIES
- IMPROVEMENT OF SEED AND FERTILIZER SUPPLY
- RICE SELF SUFFICIENCY AND EXPORT
- AGRICULTURAL MACHINERY LOAN AND GRAND
- CAPACITY BUILDING OF EXTENSION WORKER & FARMER
**Farm Machinery Loan and Grant 2014-2017**

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Traktor R2</td>
<td>1.567</td>
<td>3.996</td>
<td>15.435</td>
<td>26.100</td>
<td>46.980</td>
<td>25.000</td>
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<tr>
<td>Traktor R4</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>1.000</td>
<td>2.280</td>
<td>3.000</td>
</tr>
<tr>
<td>Pompa</td>
<td>600</td>
<td>2.002</td>
<td>7.122</td>
<td>21.953</td>
<td>19.518</td>
<td>21.000</td>
</tr>
<tr>
<td>Rice Transplanter</td>
<td>-</td>
<td>153</td>
<td>279</td>
<td>5.000</td>
<td>7.854</td>
<td>3.000</td>
</tr>
<tr>
<td>Combine Harvester</td>
<td>355</td>
<td>-</td>
<td>180</td>
<td>3.185</td>
<td>9.564</td>
<td>3.984</td>
</tr>
<tr>
<td>Power Thresher</td>
<td>400</td>
<td>-</td>
<td>201</td>
<td>1.654</td>
<td>9.432</td>
<td>604</td>
</tr>
<tr>
<td>Dryer</td>
<td>183</td>
<td>-</td>
<td>29</td>
<td>271</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>RMU</td>
<td>333</td>
<td>575</td>
<td>151</td>
<td>386</td>
<td>-</td>
<td>21</td>
</tr>
</tbody>
</table>
4. SOME PROBLEMS IN DEVELOPING SUSTAINABLE AGRICULTURAL MECHANIZATION

Problems:

a) Miss match between agricultural machinery and agroecosystem, socio-economic and cultural condition of Indonesian farmers in each district.

b) Lack of number and capability of human resources dealing with agricultural mechanization development are weak,

c) Inspection and control of agricultural machinery at the market are weak,
5. STRATEGY FOR DEVELOPMENT OF SUSTAINABLE AGRICULTURAL MECHANIZATION TO SUPPORT RICE PRODUCTION AND SELF-SUFFICIENCY AND EXPORT

Based on the experience in developing agricultural machinery custom hiring unit, Agricultural Mechanization in Indonesia in Indonesia will sustain if there are:

a) Able to respond the problem in the right manner,
b) Has comparative advantage compared to other technology,
c) Suitable with farmer and farming condition,
d) Environmentally acceptable,
e) Give benefit and better income to the stakeholder,
f) Available after sales service guarantee are available (training for manager, technician, operator, spare part, repair and maintenance).
A. REGULATION

1. Government Regulation Number 65, year 1971 related to the regulation of industry of rice milling unit, rice husker and polisher. (to control the number and specification of RMU to increase recovery, rice quality and efficiency of RMU)

2. Indonesia Act Number 12 year 1992 concerning Crops Farming System. (Production and distribution of agricultural machinery and tools need to be controlled, monitored and supervised)


6. Ministry of Manpower Regulation Number No 217 year 2016. (Performance Standard of Competency for Indonesian Worker working in the area of Agricultural Mechanization Development for: planner, engineer, manager, operator and technician of agricultural machinery and tools.

7. Guideline of DG of Agriculture Infrastructure, 2017. (Guideline for the implementation of procurement, distribution, and grand of Agricultural Machinery)


B. Strategy for Development of Sustainable Agricultural Mechanization

**Rice Production**

**Quality & Efficiency**

**Price**

**Sustainable Production & Export**

**Self Sufficiency**

**Competitiveness**

**Stability**

1. Continuation of 2-5
2. Development of Modern Food silo
3. Development of integrated modern bio industry
4. Increasing export of agril machinery

**Supporting System** (Infrastruktur, policy & investment)

1. Develop modern agril in all provinces
2. Development of Modern Food silo in all provinces
3. Development of integrated & modern bio industry
4. Increasing export of agril machinery

- Grand and introduction of agril machinery
- Optimizing agril existing machinery
- Strengthening Custom Hiring, (manager, technician and worship, operator
- Strengthening agril machinery industry
- Standardistion & certification of agril Machinery
- Deregulation import of agril machinery
- Strengthening R&D on agril machinery
Strategy Phase I.

1. Introduction of agrl machinery,
2. Provide grand to farmer and farmer group
3. Optimie existing agricultural machinery through developing various model of sustainable agricultural mechanization
4. Strenghtening Custom Hiring Business Unit (manager, technician, operator and workshop)
5. Strenghtening agricultural machinery industry
6. Strenghtening standard & sertification of agricultural Machinery
7. Deregulation import of agricultural machinery
8. Strenghtening R&D on agricultural machinary
Srtrategy Phase II

1. Continuation strategy phase I number 3-6
2. Development modern farming system with agricultural mechanization in all provinces
3. Development of modern food processing industry
4. Provide loan for agricultural machinery to farmer and farmer group
5. Increase the efisiency of agricultural machinery industry
Strategy Phase III

1. Continuation strategy phase II number 2-5
2. Development of modern food silo
3. Development of integrated modern bio industry
4. Increasing export of agril machinery
Strategy phase IV

1. Development of modern Food Silo in all provinces
2. Development of integrated & modern bio industry
3. Increasing export of agricultural machinery
Model of modern rice farming system fully mechanized has been developed and tested in number of district, i.e. in Jawa, Sulawesi and Kalimantan Provinces. The area of the each model was between 100-200 ha. Good agricultural practices (GAP) was rice planting using Jajar Legowo method, application of balance fertilizer base on soil fertility map, pest control and introduction of farm machinery for land preparation, rice transplanting, weeding and harvesting.
Location of modern rice farming system:

Sukoharjo, Central Jawa: 200 ha, 2015
Pontianak, West Kaimantan; 100 ha, 2015
Boyolali, central Jawa, 100 ha, 2016
Sidoarto District, East Jawa 100 ha, 2016
Klaten, Central Jawa. 100 ha, 2017
Indramayu district, West Jawa 150 ha, 2017
Activity and output of the model

Power tiller and 4 wheel tractor equipped with disk plow, rotary tiller, and leveler for land preparation, walking type jajar llegowo rice transplanter with dapok seedling trays, power weeder, combine harvester and post harvest machinery consist of circulated vertical dryer, rice milling unit to produce good quality of milled rice and storage has been introduced to farmer and group.

Modern rice farming has increases productivity by 2 ton/ha, Reduce the use of labor up to 70% and reduce labor cost up to 30% compared to manual method. The scattered losses decrease by 6 %, milling recovery increases by 6% and rice quality increases compare to existing methods (Table 2, 3 and 4).
<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>
### Table 3. The use of agricultural machinery has reduced labor cost/ ha-season

<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><strong>Land preparation</strong></td>
<td>1.600.000</td>
<td>1.200.000</td>
<td>-400.000</td>
</tr>
<tr>
<td><strong>Seedling and planting</strong></td>
<td>1.720.000</td>
<td>1.100.000</td>
<td>-620.000</td>
</tr>
<tr>
<td><strong>Weeding</strong></td>
<td>1.200.000</td>
<td>510.000</td>
<td>-690.000</td>
</tr>
<tr>
<td><strong>Harvesting</strong></td>
<td>2.857.125</td>
<td>2.285.700</td>
<td>-571.425</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.377.125</strong></td>
<td><strong>5.095.700</strong></td>
<td><strong>-2.281.425</strong></td>
</tr>
</tbody>
</table>
Table 4. Loss reduction due to the use of combine harvester and improved RMU

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>LOSES (%)</th>
<th>QUALITY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>Improved</td>
</tr>
<tr>
<td></td>
<td>method</td>
<td>machinery</td>
</tr>
<tr>
<td>Rice harvesting</td>
<td>+ 9.4</td>
<td>+ 3</td>
</tr>
<tr>
<td>Threshing</td>
<td>+ 5</td>
<td>+ 2</td>
</tr>
<tr>
<td>Drying:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milling Recovery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole grain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broken grain</td>
<td></td>
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</tr>
</tbody>
</table>

Indonesian Agency for Agricultural Research and Development, 2013
Land preparation: 2 and 4 wheel tractor
Transplanting: Jajar Legowo Transplanter
Weeding: Power weeder
Harvesting: combine harvester

GAP: 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
7. CLOSING REMARK

Indonesia Policy, regulation, strategy and program of the development sustainable agricultural machinery to increase rice production and surplus, increasing competitiveness and stability and finally export has been formulated.

Various model of modern rice farming supported with full agricultural mechanization have been developed.

The success in implementing the policy, regulation, program will strongly depend on implementation and collaboration between all stakeholders.
THANK YOU
# Rice Production and Consumption in Indonesia

<table>
<thead>
<tr>
<th>Year</th>
<th>Harvested area (mill ha)</th>
<th>Yield (mt/ha)</th>
<th>Production (mill mt, paddy)</th>
<th>Consumption (mill mt, rice)</th>
<th>Import (thousand mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>11.8</td>
<td>4.6</td>
<td>54.2</td>
<td>33.7</td>
<td>236.9</td>
</tr>
<tr>
<td>2006</td>
<td>11.8</td>
<td>4.6</td>
<td>54.5</td>
<td>34.2</td>
<td>189.6</td>
</tr>
<tr>
<td>2007</td>
<td>12.1</td>
<td>4.7</td>
<td>57.2</td>
<td>36.8</td>
<td>1406.8</td>
</tr>
<tr>
<td>2008</td>
<td>12.3</td>
<td>4.9</td>
<td>60.3</td>
<td>37.4</td>
<td>286.7</td>
</tr>
<tr>
<td>2009</td>
<td>12.9</td>
<td>5.0</td>
<td>64.0</td>
<td>39.9</td>
<td>250.5</td>
</tr>
<tr>
<td>2010</td>
<td>13.3</td>
<td>5.0</td>
<td>66.5</td>
<td>41.2</td>
<td>687.6</td>
</tr>
<tr>
<td>2011</td>
<td>13.2</td>
<td>5.0</td>
<td>65.8</td>
<td>43.3</td>
<td>2750.5</td>
</tr>
<tr>
<td>2012</td>
<td>13.4</td>
<td>5.1</td>
<td>69.1</td>
<td>43.5</td>
<td>1810.4</td>
</tr>
<tr>
<td>2013</td>
<td>13.8</td>
<td>5.2</td>
<td>71.3</td>
<td>45.4</td>
<td>472.2</td>
</tr>
<tr>
<td>2014</td>
<td>13.8</td>
<td>5.1</td>
<td>70.8</td>
<td>46.2</td>
<td>844.2</td>
</tr>
<tr>
<td>2015</td>
<td>14.1</td>
<td>5.3</td>
<td>75.4</td>
<td>48.1</td>
<td>*)</td>
</tr>
<tr>
<td>Growth (%/year)</td>
<td>1.76</td>
<td>1.55</td>
<td>3.41</td>
<td>4.01</td>
<td>-</td>
</tr>
</tbody>
</table>
TREND OF POPULATION, RICE PRODUCTION AND CONSUMPTION IN INDONESIA