Introduction of CA Techniques in DPR Korea

International Seminar on Enhancing Extension of Conservation Agriculture Techniques in Asia and Pacific
25. October. 2007
23M. Population
2M ha. Arable land
580,000 ha of paddy
600,000 ha of non-paddy
Disadvantage of agricultural practice
In DPRK.

• Continuous decrease of soil fertility
  (low humus contents and available soil nutrients,
   Severe soil loss caused by heavy rains in summer)
• Lack of agricultural materials
  (Low inputs of organic and inorganic materials
   comparative with target yields, fuels and etc.)
• More time and working schedules to prepare
  field for double crop system.
CA experimental activities in DPRK

- Test on the CA in DPRK was started in 3 farms since 2003 with support of FAO TCP project
- We have a considerable experiences and increased our technical capacity for full adoption to our condition.
- We expanded CA practice into 22 farms under FAO rehabilitation project.
No till- Rice transplanting after wheat *(Komhung farm)*
Direct seeding of Rice
CA in paddy (Winter wheat sowing after rice harvest)

Winter wheat direct seeding on the same day of rice harvesting (Ryuso Farm)

No-till

No-till direct sowing with stubble cover (Posan Farm)
Potato growing under no till cover condition at Yaksu farm

- 2m wide ridge
- Put potato seed under rice stubble covered
- Keeping rice and potato straw with no till
- Rice transplanting on mid of June
Soybean seeding after wheat on sloppy land
Good germination of soybean with wheat stubble retention
Wheat seeding after maize harvest: Ryongchon Farm, Hwangju County
CA demonstration plot in Ryongchon Farm, Hwangju County

Wheat direct seeding with maize stubble retention
Intercropping; Maize – Soybean after Wheat
GMCC (hairy vetch) for seeding
(it can harvest 20~30t/ha. of green matter before seeding)

Keeping optimum times and dose of herb application

Seeding at beginning of Oct. to resist severe winter cold.

Harvesting at end of May for good next crops.
GMCC varieties selection to fit DPRK climate
No-till direct seeding in maize single crop field
(Songmun Farm, Samsok District)
Result of CA trial

- Improved soil fertility and 50-60% reduction of wind erosion and rainfall
- 10-15% increase of yield
- 15-25% of saving of production cost
Improved soil fertility through stubble decomposition
## Soil improvement in upland field (2003 ~2005)

<table>
<thead>
<tr>
<th>Site</th>
<th>Cultivation type</th>
<th>OMC (%)</th>
<th>N</th>
<th>P2O5</th>
<th>K2O</th>
<th>Soil Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Song Mun Farm</td>
<td>Traditional</td>
<td>1.5</td>
<td>12.8</td>
<td>15.7</td>
<td>No-cover</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maize residue cover</td>
<td>1.9</td>
<td>8.7</td>
<td>16.5</td>
<td>Maize residue cover 6t/ha</td>
<td></td>
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<tr>
<td></td>
<td>GM-Maize</td>
<td>1.7</td>
<td>8.8</td>
<td>14.8</td>
<td>GM 5t/ha</td>
<td></td>
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<td>16.4</td>
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<tr>
<td></td>
<td>GM-Maize</td>
<td>1.8</td>
<td>7.8</td>
<td>19.5</td>
<td>GM 7t/ha</td>
<td></td>
</tr>
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<td>5.7</td>
<td>8.8</td>
<td>No-cover</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GM-Maize</td>
<td>1.8</td>
<td>8.8</td>
<td>11.1</td>
<td>GM 7t/ha</td>
<td></td>
</tr>
</tbody>
</table>
Soil erosion decrease on sloppy land

Washing up of sloping land (m³/ha.)

<table>
<thead>
<tr>
<th>plot</th>
<th>index</th>
<th>m³</th>
<th>Dif.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA</td>
<td></td>
<td>155</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CA</td>
<td></td>
<td>75.2</td>
<td>79.8</td>
<td>48.5</td>
</tr>
</tbody>
</table>

110mm: 1.45 Sukchon

Soil looses by washing up

<table>
<thead>
<tr>
<th>plot</th>
<th>index</th>
<th>T/ha</th>
<th>Dif.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA</td>
<td></td>
<td>35.0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>CA</td>
<td></td>
<td>5.0</td>
<td>30.0</td>
<td>70.0</td>
</tr>
</tbody>
</table>
Improved physical characteristics in upland soil

Soil density (g/cm²)
- Whet-Soybean (TA) 1.34 (CA) 1.33
- Maize cover (TA) 1.34 (CA) 1.34

Soil Moisture
- B.S: (TA) 18.5% (CA) 22.5%
- A.S: (TA) 25.1% (CA) 27.5%
## Improved soil bulk density of CA plot

<table>
<thead>
<tr>
<th>Soil types</th>
<th>Method</th>
<th>bulk density (g/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy</td>
<td>TA</td>
<td>1.28</td>
</tr>
<tr>
<td></td>
<td>CA</td>
<td>1.26</td>
</tr>
<tr>
<td>Non-P</td>
<td>TA</td>
<td>1.24</td>
</tr>
<tr>
<td></td>
<td>CA</td>
<td>1.20</td>
</tr>
</tbody>
</table>

Songmun farm, Samsok, 5 cm layer 2006
Number of useful soil animals has increased

Good stubble cover

- Number of earthworm, spider, frogs increased

- Songmun; CA-236, TA-36
- Ryongchon; CA-194, TA-24
- Jungsan; CA-76, TA-28
Increase of yield

 Trials show that yield in CA is 10-15% more than traditional farming.

 10% increase of rice and maize yield.
 30% increase in soybean production.
### CA effectiveness to TA (rice yield. kg/ha)

<table>
<thead>
<tr>
<th></th>
<th>CA (Direct Seeding)</th>
<th>TA (Rice transplanting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single crop (rice)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CA (Direct Seeding)</td>
<td>7910</td>
<td></td>
</tr>
<tr>
<td>TA (Rice transplanting)</td>
<td>7620</td>
<td></td>
</tr>
<tr>
<td>Double crops (wheat;rice)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CA (No-till rice trans.)</td>
<td>4920</td>
<td></td>
</tr>
<tr>
<td>TA (Rice transplanting )</td>
<td>4170</td>
<td></td>
</tr>
</tbody>
</table>

* No-till rice trans. + S.(4t/ha of wheat straw after wheat)
No-till direct seeding
Yield (maize) increase in 3 project farms.
Maize field in Songmun Farm

- 2005.7.7
- 2005.8.19
Ryongchon Farm

Nineteenth of August

Fifth of October
### Economic benefit of CA compared with TA

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>TA</th>
<th>CA</th>
<th>Labour (person/ha)</th>
<th>Fuel (Kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy</td>
<td>72</td>
<td>28</td>
<td>339</td>
<td>179</td>
</tr>
<tr>
<td>Upland</td>
<td>35</td>
<td>19</td>
<td>195</td>
<td>91</td>
</tr>
</tbody>
</table>
CA machinery

Maize planter
Small-maize, soybean planter
Rice/wheat seeder
Animal traction planter
Conclusion

CA ensures sustainable production resources on the basis of natural materials recycling.

- Increase of soil preservation capacity by residue cover and rational rotation system
- Improves of soil structure by biological strata such as crop roots, earthworms, etc
- Keep and increase of nutrients in soil thanks to the crop residue cover and GMCC
CA contributes to high agricultural production and economic benefits.

- Yield increase
- Save much labor, time and fuel
- Soil and environmental protection.
  
  *Harmonious with nature and bio-ecosystem.*
Thank you for your attention