Low-cost Organic Cultivation Status and Development Strategy of Rice in Korea

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Organic Evangelist dreamy organic paradise, the Garden of Eden to the earth

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Chief of Organic Agriculture Division

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1. Organic cultivation status and problems in Korea
2. Low-cost organic cultivation technology of rice
3. Development strategy of rice organic cultivation
1. Organic cultivation status and problems in Korea

-Certified Area: ‘01 1,745ha → ‘16 79,479ha (ratio 4.9%) 46 times

Organic: 450 19,862ha (ratio 1.2%)
Non-pesticide: 1,295 59,617ha (ratio 3.7%)

-Jeonnam province 51%, Jenbuk 9%, Chungnam 8%
<table>
<thead>
<tr>
<th>crops</th>
<th>Total</th>
<th>Organic</th>
<th>Non-pesticide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>51,256</td>
<td>10,336</td>
<td>40,920</td>
</tr>
<tr>
<td>Wheat</td>
<td>2,214</td>
<td>545</td>
<td>1,669</td>
</tr>
<tr>
<td>Soybean</td>
<td>951</td>
<td>334</td>
<td>617</td>
</tr>
<tr>
<td>Mung bean</td>
<td>165</td>
<td>32</td>
<td>133</td>
</tr>
<tr>
<td>Tomato</td>
<td>436</td>
<td>130</td>
<td>306</td>
</tr>
<tr>
<td>Pepper</td>
<td>459</td>
<td>201</td>
<td>258</td>
</tr>
<tr>
<td>Cabbage</td>
<td>611</td>
<td>213</td>
<td>398</td>
</tr>
<tr>
<td>Chinese cabbage</td>
<td>471</td>
<td>141</td>
<td>330</td>
</tr>
<tr>
<td>Radish</td>
<td>516</td>
<td>156</td>
<td>360</td>
</tr>
<tr>
<td>Onion</td>
<td>580</td>
<td>150</td>
<td>430</td>
</tr>
<tr>
<td>Garlic</td>
<td>405</td>
<td>96</td>
<td>309</td>
</tr>
<tr>
<td>Grape</td>
<td>294</td>
<td>106</td>
<td>188</td>
</tr>
<tr>
<td>Blueberries</td>
<td>1,045</td>
<td>163</td>
<td>882</td>
</tr>
<tr>
<td>Chestnut</td>
<td>6,798</td>
<td>1,770</td>
<td>5,028</td>
</tr>
</tbody>
</table>
Problems of Organic Agriculture in Korea

-Lack of recognition of soil and ecosystem conservation
-Material-dependent high input agriculture for high yield
-No rotation system established
-Crop cultivation and livestock circulation not established
-Excess fertilization of livestock manure
-No standard technology established

[Diagram with Korean text]
Organics are gold in the soil

Taking rice straw from a rice paddy while doing organic farming

Disconnection of natural circulation ring !!!
Good quality organic matter supply is easy to grow green manure crops!

**Legume crop**

- Hairy vetch
- Milk vetch
- Red clover
- Vicia angustifolia

**Gramineae crop**

- Rye
- Barley
- Maize
- Sudangrass
# Fertilizer value of major green crops (kg/10a)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Fresh wt.</th>
<th>N content</th>
<th>K content</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legume</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austrian pea</td>
<td>2,688</td>
<td>16.5</td>
<td>13.7</td>
</tr>
<tr>
<td>Hairy vetch</td>
<td>2,503</td>
<td>19.7</td>
<td>20.4</td>
</tr>
<tr>
<td><strong>Gramineae</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>3,362</td>
<td>13.4</td>
<td>22.9</td>
</tr>
<tr>
<td>Wheat</td>
<td>4,390</td>
<td>15.5</td>
<td>24.3</td>
</tr>
<tr>
<td>oat</td>
<td>2,085</td>
<td>10.6</td>
<td>18.6</td>
</tr>
<tr>
<td>Italian Grass</td>
<td>3,735</td>
<td>13.0</td>
<td>30.2</td>
</tr>
<tr>
<td><strong>Legume + Gramineae</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley + Hairy vetch</td>
<td>4,095</td>
<td>17.6</td>
<td>22.6</td>
</tr>
<tr>
<td>Barley + Pea</td>
<td>4,007</td>
<td>17.7</td>
<td>22.3</td>
</tr>
</tbody>
</table>
2. Low-cost organic cultivation technology of rice

Green manure crop suitable for rice farming – Hairy vetch
Hairy vetch sowing method video
Hairy vetch cultivation

- Sowing 10 days before rice harvest: Late Sep. ~ Mid Oct.
- Sowing after rice harvest: October to late October
- seed seeding rate: 5 ~ 9 kg / 10a
  (Mixed: 3 kg of hairy vetch + rye or barley 8 kg / 10a)
- In the middle of May, tillage input: 1,500 ~ 2,000 kg / 10a
  The amount that exceeds 2,000 kg use in other field or livestock feed
Yield variation in organic cultivation by year (06~14)

compared to the conventional cultivation reduced yield was
3% in the first year, 19% in the third year, 6% in the fifth year.
7th and 8th years, it increased by 2 ~ 3%.
9 years average 7% reduction

※ Tested variety : Hopyeong, Ilmi, Dongjin1, Unkwang (2006~2009),
Hopyeong, Ilmi, Dongjin1 (2010~2014)
Bakanae disease symptom
Disinfection method of organic seed using hot water sterilizer

- Seed volume for one time disinfection
  - Water : Seed ratio = 10 : 1 (300L : 30kg)

- Disinfection method
  1) Sterilizer temperature set at 60 ℃
  2) Put in seed (in 10kg unit) and immersed for 10 minutes
  3) Immerse in cold water immediately after soaking in hot water (10 minutes) and perform germination work
Organic seed disinfection video

온탕소독 준비물 : 냉각수통 여러개
Seed sowing (100~130g/ Nursery Box) and Seedlings

35 ~ 40 days Seedling
20 ~ 25cm Height,
4.5 ~ 5.5 leaves
Optimum planting density in organic rice cultivation

- Test varieties: Hopyeong rice, Pyongan rice
- Sowing season: April 26  
- Trance planting time: June 5 (40 days)
- Plant density: 30×12cm (27.3 plant), 14cm (24.2), 18cm (18.4), 22cm (15.2), 26cm (12.7), 30cm (10.9)
- Fertilization method: green manure crops (4 years of hairy vetch)

Yield by varieties and planting density (2009)

Optimum planting density: 30×18cm (18.4 plant/m²)  
                          30×22cm (15.2 plant/m²)
2~4 plant/hill, Wide planting, Deep water management

Through deep water management
Creating a fan-shaped rice

Plant density: 30 x 18~22cm
(18.4~15.2 plant/m²)

Enhance sunlight penetration and ventilation
Weed control method in rice organic cultivation

- Pellet rice bran
- EM molasses
- Duck
- Paper mulching
- Rice bran spray
- EM molasses
- Freshwater snails
- Mechanical weeding
The type of freshwater snails being used

- **small snails**: 30 to 40 days after hatching, No. 2,000/kg
- **middle snails**: 40 to 50, 700 ~1,000/kg
- **big snails**: 60 to 90, 200 ~ 300/kg

Images of snails and snail eggs.
Controllable weeds

Some non-eating weeds
Mechanical weeding
이 페이지는 한국어로 작성된 환경 친화적 벼의 해충 관리 교재입니다. 페이지에는 다양한 해충의 종류와 그들의 대책이 나열되어 있습니다. 예를 들어, 일도열병, 잠업무늬말벌병, 벼벌바구미, 벼벌, 증명나방 등이 포함되어 있습니다.

<table>
<thead>
<tr>
<th>시기</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>상태</td>
<td>상중하</td>
<td>상중하</td>
<td>상중하</td>
<td>상중하</td>
<td>상중하</td>
<td>상중하</td>
<td>상중하</td>
<td>상중하</td>
</tr>
</tbody>
</table>

재배
- 벼씨 준비 및 소독: 10ℓ 당 4kg 내외로 30℃에 10분 또는 65℃에서 7분간 담금
- 물관리: 모낸 후 30일간 7~10cm로 깊이 대 주어 잡초 박아 억제시킴
- 왕우령이 이용 제초: 모낸 후 10일 이내에 10ℓ당 5kg 내외 투입
(서례질 후 7일 이내에 모내기하고 논둑을 높이고 배수로 막 설치하고 어린 모, 직파재배는 피해야 우려효으로 지양)

병해충 방제 시기 및 농자재
- 일도열병: 석회보르도액, 박도염, 당귀, 마늘, 계피+당귀, 당귀+생강, 당귀+마늘
- 잠업무늬말벌병: 오백자, 감초, 합황피
- 증명밀밀벌병: 애벌레 방제, 이병성 품종 재배시 주위 논 보다 2~3일 늦게 이양
- 벼벌바구미: 벼스탑, 왕중와, 바게미, 알코올
- 벼벌: 박마루, 스파이더, 크릴유, 벌레리아, 명의, 헬퍼3-1, 진장군, 진암, 설탕, 바이진, 마늘, 죽순+흑설탕, 편백유, 은행암+한미식초: 젠피+한미식초, 자리공+한미식초: 무공해제조비누, 울금(주정추출)
- 증명나방: 벼스탑, 왕중왕, 흉명이, 속바람
## Major organic farming practices in Korea

<table>
<thead>
<tr>
<th></th>
<th><strong>Standard organic cultivation</strong></th>
<th><strong>Resource circulation agriculture</strong></th>
<th><strong>natural cultivation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fertility management</strong></td>
<td>Hairy vetch, Rice straw, Non-additional fertilizer</td>
<td>Compost, Self-made Nutrients</td>
<td>Rice straw Non-input</td>
</tr>
<tr>
<td><strong>Tillage</strong></td>
<td>Tillage</td>
<td>Tillage</td>
<td>Minimum-tillage</td>
</tr>
<tr>
<td>Plant density/m²</td>
<td>50~60</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>Weed control</strong></td>
<td>Snails</td>
<td>Snails</td>
<td>Snails</td>
</tr>
<tr>
<td><strong>Pest control</strong></td>
<td>environment-friendly materials 1 time or no</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Other materials</strong></td>
<td>No</td>
<td>Self-made Nutrients 3 times</td>
<td>No</td>
</tr>
</tbody>
</table>
Standard organic cultivation
Resource circulation agriculture

Spraying indigenous microorganisms

Nutrient spray

<table>
<thead>
<tr>
<th>Indigenous microorganism</th>
<th>Nutrients by natural plant (Wormwood, parsley, acacia)</th>
<th>Nutrients by medicinal herbs (Angelica, cinnamon, licorice, ginger, garlic)</th>
</tr>
</thead>
</table>
Natural cultivation
No pesticide, No fertilizer, No compost
<table>
<thead>
<tr>
<th>Type</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>average</th>
<th>index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard organic cultivation</strong></td>
<td>483</td>
<td>529</td>
<td>511</td>
<td>516</td>
<td>475</td>
<td>503</td>
<td>96</td>
</tr>
<tr>
<td><strong>Resource circulation agriculture</strong></td>
<td>496</td>
<td>514</td>
<td>569</td>
<td>521</td>
<td>498</td>
<td>520</td>
<td>99</td>
</tr>
<tr>
<td><strong>Natural cultivation</strong></td>
<td>431</td>
<td>358</td>
<td>392</td>
<td>375</td>
<td>344</td>
<td>380</td>
<td>72</td>
</tr>
<tr>
<td><strong>Conventional cultivation</strong></td>
<td>529</td>
<td>504</td>
<td>517</td>
<td>517</td>
<td>561</td>
<td>526</td>
<td>100</td>
</tr>
</tbody>
</table>
## Comparison of production cost by organic cultivation type

(2012~2013)

<table>
<thead>
<tr>
<th></th>
<th>Conventional cultivation</th>
<th>Standard organic Cultivation</th>
<th>Resource circulation agriculture</th>
<th>Natural Cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Income ($/10a)</strong></td>
<td>615(100)</td>
<td>887(144)</td>
<td>865(141)</td>
<td>711(116)</td>
</tr>
<tr>
<td><strong>Production cost ($/10a)</strong></td>
<td>718(100)</td>
<td>756(105)</td>
<td>1,017(142)</td>
<td>582( 81)</td>
</tr>
<tr>
<td><strong>Yield(kg/10a)</strong></td>
<td>511(100)</td>
<td>498( 97)</td>
<td>542(106)</td>
<td>375( 73)</td>
</tr>
<tr>
<td><strong>Price($/kg)</strong></td>
<td>1.9(100)</td>
<td>2.6(133)</td>
<td>2.6(133)</td>
<td>2.7(142)</td>
</tr>
<tr>
<td><strong>Palatability value</strong></td>
<td>67.2</td>
<td>75.3</td>
<td>74.9</td>
<td>78.6</td>
</tr>
<tr>
<td><strong>Protein con. (%)</strong></td>
<td>6.4</td>
<td>5.8</td>
<td>5.9</td>
<td>5.4</td>
</tr>
</tbody>
</table>
Low-cost organic rice cultivation

- Hairy vetch
- Snails

-> Chemical fertilizer
  100% replacement

-> Herbicide
  100% replacement
3. Development strategy of organic rice cultivation

1) Stable consumption expansion by using obligatory organic rice for school, military, and public meals

2) Promotion of low-input, low-cost organic rice cultivation by growing green manure crops in the whole area of rice in Korea
1) Stable consumption expansion by using obligatory organic rice for school meals, military meals, and public meals
organic rice is expensive?

Organic feed
$18

Organic rice
$4

1kg Price
Rice price of a bowl?

General rice  
children  $0.12 (60g), adults $0.2 (100g)

Organic rice  
$0.18, $0.3

Organic rice for school lunch added $1.2 a month

Coffee

$4

$0.36
Feed organic rice to schools and military
Save our children's health and environment!

- School, military mesl 50,000ha Rice Organic cultivation required
- Government officials, hospitals, large corporations 250,000ha

Organic cultivation rate in Korea 1.2% → 20%
2) Promotion of low-input, low-cost organic cultivation

- External material input
  - Organic fertilizer
  - Microbial control agent
- Local resource circulation
  - Green manure
  - Crop rotation
- Ecological harmony
  - Natural enemy
  - Farmer's self-made
- green grass biodiversity
  - Ecological control
  - Sulfur, copper preparation
  - Natural extract

natural organic
Rice grade in Korea

1. Premium organic rice
2. Organic rice
3. Non-pesticides rice
4. High quality rice
5. Conventional rice

- Organic fertilizer
- Natural extract
- Microbial control agent
- Sulfur, copper preparation
- Natural enemy
- Ecological control
- Crop rotation
- Farmer's self-made
- Green manure
- Local resource circulation
- Ecological harmony
- Green grass
- Biodiversity
- External material
- Input
Plant welfare !!!

organic ‘green music rice’
For every creature of God is good, and nothing to be refused, if it be received with thanksgiving (1 Timothy 4:4)

Is the weed really troublesome grass? The more precious things were, the more common it was. (sunlight, water, oxygen, weed)

“잡초는 우리가 그 가치를 아직 알지 못하는 식물이다. 잡초의 뿌리는 지구 창세로부터 최초의 생명을 흡수하고 그 생명의 본체를 조응한 인간과 함께 불들고 있는 것이다. 잡초는 언제나 그 생명의 본체를 되돌려주려고 재배되는 식물 앞에서 한걸음 뒤로 물러서 있는 것이다. “

Beryl Markham, West with the Night, 1942
Conclusion

1. Low-cost organic farming is the best way to make healthy and pure soil through cultivation of green manure crops
   - continuously support the supply of green seeds and joint seeding in the country

   * General Rice cultivation is also highly recommended to use green manure crops and snails

2. Stable consumption expansion by using obligatory organic rice for school meals, military meals, and public meals
   - school, military meals: 50,000ha Rice Organic cultivation required
   - government officials, hospitals, large corporations: 250,000ha

Organic cultivation rate in Korea 1.2% → 20%

At present 'high-input, high-cost, high production organic farming'
Future 'low-input, low-cost, medium production organic farming'
Hope and New Future on the Korean Peninsula
Welcome to Asia’s Latest Organic Retreat: North Korea
By CHARLIE CAMPBELL / DANDONG AND BEIJING
TIME July 29, 2016

“I trust food safety in North Korea as it is all organic,” says one Dandong-based Chinese trader who regularly travels all over North Korea.
“I can feel the organic taste from potatoes and beans in North Korea, but in China you rarely get food like that. I find it cozy to occasionally live in North Korea for 10-15 days. The isolation makes me feel relaxed.”

그러나 중국에서는 이런 식품을 거의 먹을 수가 없다. 나는 때때로 10-15 일 동안 북한에 살기를 아늑한 것으로 본다. 격리는 나를 편안하게 만든다.

Land of communication and peace
Demilitarized zone(DMZ) is alive
God's blessing on organic agriculture of the Philippines!

Thanks