GLOBAL AGENDA OF ACTION IN SUPPORT OF SUSTAINABLE LIVESTOCK SECTOR

CONSULTATION ON FOCUS AREA NUMBER 3: REDUCED DISCHARGE - TOWARDS FULL RECOVERY OF NUTRIENT AND ENERGY FROM ANIMAL MANURE

SEOUL, 24-27 APRIL 2012
THE HOAM FACULTY HOUSE AT SEOUL NATIONAL UNIVERSITY
I. Contemporary Status of Major Livestocks

II. Production Practices of Major Livestocks
   Treatment Systems of Their Manure

III. Land Application of Liquid Fertilizer/Compost from Biodegraded Livestock Wastewater

IV. Green Growth Policy of Crop–Animal Farming
Contemporary Status of Major Livestocks
Livestock Production—Beef Cattle

Lower Carbon Green Growth
Livestock Production—Swine

- Head / Farm: 794.9
- Head: 897.2
- Farm: 1230
- Farm: 1231

Lower Carbon Green Growth

Livestock Production — Swine

Heads (M)  
Farm (T)

Number of Farms


Livestock Production — Swine

Heads (M)  
Farm (T)

Number of Farms
Livestock Production - Layer

Heads / Farm

2006 1/4: 28976
2006 2/4: 30203
2006 3/4: 34844
2007 1/4: 35777
2007 2/4: 38157
2007 3/4: 41449

Number of Farm

Lower Carbon Green Growth
Livestock Production—Dairy Cattle

Head / Farm

- 2006: 54.55
- 2007: 57.41
- 2008: 61.67
- 2009: 63.89
- 2010: 67.19
- 2011: 65.74

(T) Heads (T) Farms

Lower Carbon Green Growth
Livestock Products Consumed

Kg/capita/yr


Korea
Japan
EGG
PORK
CHICKEN
BEEF
MILK

Lower Carbon Green Growth

Source: ‘가축통계’ 농림부, 2011
## Total Agric. Products

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<th>2005</th>
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<td>2.2</td>
<td>810</td>
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<tr>
<td>10</td>
<td>Duck</td>
<td>1.8</td>
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\[ \sum_{LP(\%)} \] = 31.3  
\[ \sum_{LP(\%)} \] = 34.0  
\[ \sum_{LP(\%)} \] = 40.2
### WPollution Contribution of LWW (T ton/day)

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<th>TP</th>
<th>MWW</th>
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<td>WW prod</td>
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<td>BOD prod</td>
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<td>3,097</td>
<td>2,627</td>
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<tr>
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<td><strong>41</strong></td>
<td><strong>35</strong></td>
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### Water Pollution Contributor in Reservoirs

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<th>Livestock</th>
<th>Industrial/Resort</th>
<th>Nature(Land)</th>
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<td>Jinyang</td>
<td>40.2%</td>
<td>22.9%</td>
<td>31.0%</td>
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<td>36.8</td>
<td>56.0</td>
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<td>Daechung</td>
<td>53.4</td>
<td>37.1</td>
<td>3.2</td>
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Summary

- No. of Livestock increases with decrease of producers so mean no. of head per producer increases.

- In case of dairy cattle, both, No. of head and No. of producer decreases, however mean no. of head per producer increases. Because no. of producer decrease faster than does livestock head, so mean no. of head per producer increases.

- Contribution of livestock products to Total Amount of Ag. Production has been increasing with time.

- However water bodies are polluted by improper treatment of Livestock manure because of surplus amount in a limited area.

- Need options to settle down the issues.
Production Practices of Major Livestocks
The mixture with bedding materials such as rice hull or sawdust
The mixture w/ bedding materials such as rice hull or sawdust
A multi-tier cage is the most common for layers
poultry manure is dried in the belt for days and
scraped out and removed
Broiler House

Relay Fans for Air Circulation

Chimney Fans

- Bedding with rice hull or saw dust and scraped out after marketed

Lower Carbon Green Growth
Plastic plate with perforated holes is bedded on floor.
Slurry is in the pit of which mc is over 90%, typically 93–95%
## Livestock Waste TRT systems

As of 2008, T ton/yr

<table>
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<th>Livestock</th>
<th>Total Amount</th>
<th>Resourcing</th>
<th>Purif’n</th>
<th>PWWTP</th>
<th>Ocean Dumping</th>
<th>Others</th>
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<td></td>
<td></td>
<td>Solid C.</td>
<td>Liquid C.</td>
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<td>Total Livestock Waste</td>
<td>41,743</td>
<td>32,912</td>
<td>2,295</td>
<td>1,184</td>
<td>2,907</td>
<td>1,460</td>
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<tr>
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<td>%</td>
<td>78.8%</td>
<td>5.5%</td>
<td>2.8%</td>
<td>7.0%</td>
<td>3.5%</td>
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<tr>
<td>Pig Slurry</td>
<td>18,610</td>
<td>12,205</td>
<td>854</td>
<td>1,184</td>
<td>2,907</td>
<td>1,460</td>
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<td>%</td>
<td>65.6%</td>
<td>4.6%</td>
<td>6.4%</td>
<td>15.6%</td>
<td>7.8%</td>
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- Ocean dumping has been prohibited since 2012. 01. 01
<table>
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<tr>
<th>Livestock Manure</th>
<th>Moisture, %</th>
<th>Type of Materials</th>
<th>Typical Trt System</th>
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<tr>
<td></td>
<td>Raw</td>
<td>Mixture</td>
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<td>Beef Cattle</td>
<td>80–81</td>
<td>60–40</td>
<td>Pseudo solid</td>
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<tr>
<td>Dairy Cattle</td>
<td>83–84</td>
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<tr>
<td>Pigs</td>
<td>85/95</td>
<td>93</td>
<td>Slurry</td>
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<tr>
<td>Broiler</td>
<td>~80</td>
<td>60–50</td>
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<tr>
<td>Layer</td>
<td>~78</td>
<td>50–60</td>
<td>Pseudo solid</td>
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</table>
Treatment Systems of Their Manure
Soild Composting System w/ Mechanical Stirrer

- Screw Stirrer
- Air Blower
- Drain
- Slurry Spray
- Odor filter
- CO$_2$

By the courtesy of AEBE, SNU, S. Korea
escalator

Agitating by **rotary** mixer

Influent port
Aerated Static Pile Composting Plant

By the courtesy of AEBE, SNU, S. Korea
Public BWWTP (Purification)

Pig farm Cluster

By the courtesy of AEBE, SNU, S. Korea
Public BWWTP

Discharge to public waterway
Gochang BGP

- Capacity: 80 kW
- Feeds: 50m³ of swine slurry (unison)
Prohibited since Jan. 01, 2012
(According to London Convention 72)

Source: http://blog.naver.com
## End-Products of Livestock Manure treated

<table>
<thead>
<tr>
<th>Type</th>
<th>Treated Livestock Manure</th>
<th>Nature of end products</th>
<th>End-Product</th>
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<tbody>
<tr>
<td>A</td>
<td>Beef, Dairy, Poultry</td>
<td>compost</td>
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<tr>
<td>B</td>
<td>Pigs</td>
<td>Liquid fertilizer</td>
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<tr>
<td>C</td>
<td>Pigs</td>
<td>Digestate</td>
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<tr>
<td>D</td>
<td>Pigs</td>
<td>Raw pig slurry</td>
<td>N/A any more</td>
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</table>
Integration of Livestock-Crop Farming

Organic Soil

BGP/BioCompost Plant SUPPLIER

Animal Farming

Livestock Products

LF/Compost/Digestate

Crop Farming Consumer

EF Crop Products

Forage

Conc. feed

Environmental-Friendly (環境親和的)
Communal Liquid & Solid Composting Plant

Lower Carbon Green Growth
Odor Abatement System

Composting System

BWWTS
Transport Car of LF to spread over Crop Field
Ironically, Two complains file from crop farmers

1) Earlier and more application of LF is urged
2) Informations on LF are tend to transferred only from swine producers

Appication of LF ProtoIcol

Environmental-Friendly (環境親和的)
## Application Protocol

### Constituent Analysis of Supplier’s LF

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**Prescribed Fertilization for his/her Cropland**

**액비분석결과 알림**

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### 영양소 분석 결과

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* 분석결과 활용: 분석결과는 영농을 위한 자료로만 활용하실 수 있습니다.*
Application Prescription for Crop Farmer

Biodata
Crop Data
Soil Analysis Data
Proper Range?
Prescribed Fertilization for his/her Cropland

Nonsan Ag. Ext. Station
# Annual Application Schedule with Crops

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(양도 사육 두수: 209,000두)
3

Land Application of Liquid Fertilizer/Compost from Biodigested Livestocks Wastewater
Application to Paddy Land
Application to Upland

Forage Crop

Barley
Application to Vegetable in GrH

- Water Melon
- Strawberries

Lower Carbon Green Growth
Application to Vegetables

Cabbage

Tomato

Maize

Lower Carbon Green Growth
Application to Fruits

Pear Orchard

Vineyard
Application to Grass in Golf Course

- Standard Fertilization Rate: 5g N/m²
- No significant difference among the treatments
Application to Tree & Plant in MT

Liriodendron tulipifera (Tulip Tree) - Deciduous

Populus tomentiglandulosa (Aspen, Polpulas)
Sudan Grass

- Prod.M: W/Wo = 3,309kg/3,050kg (/330m²)=1.085
- Net Monetary V.: W/Wo = 63,684KrW/52592(/330m²)=1.21
Groundsel (곰취)

- Prod.M: With/Appl = 4,200kg/3,000kg (/330m²) = 1.40
- Net Monetary V.: With/Appl = 41,200 TKrW/29,200kg (/330m²) = 1.41
- Prod. M: W/Wo = 4,500kg/4,000kg (/660m²) = 1.125
- Net Monetary V.: W/Wo = 11,500 TKrW/8,200kg (/660m²) = 1.4
Green Growth Policy of Crop–Animal Farming
**TMDL of Water Pollution (수질오염총량제)**

- **YELLOW CARD**
  - Hand in the reduction plan in 30 days

- **RED CARD**
  - Industrial Estate Dvlp
  - Resort Dvlp
  - Restaurant, Livestock farms etc.
  - Schools, Public Office

- Levy (basic rate: US$4.4/kg BOD$_5$/day)
  - $\text{Levy} = [\text{Profit not treated} \times \text{surplus rate coeff.} \times \text{regional coeff.} \times \text{no. violation coeff.}] - [\text{penalty paid}]$

- Water Quality seems to closely relate to Agric Activities especially livestock farming (rice farming is in common in both regions)
TOER of Air Pollution (대기오염총량제)

- 500m (swine, poultry)
- 250m (dairy cattle)
- 100m (beef cattle, horse)
Green Growth by Integration of Livestock-Crop Farming

- Reduce d Biomass imported
- No Discharge
- BGP/BCP SUPPLIER
- LF/Compost/Digestate
- Soil
- Crop Farming Consumer
- Conc. Feed
- Forage
- Livestock Products
- EF Crop Products
- Reduced Discharge ico Non-Point Source
- RD

Lower Carbon Green Growth

Conc. Feed
Green Growth by Integration of Livestock-Crop Farming

Basic concept of this project is

1) to encourage to look at the problems of Earth Environment and Food for Humans globally and good business-oriented, NOT regionally and money-seeking.
2) To set a system for Prevention rather than treatment

Piloting and Validating an IFCA Project and Disseminating and Implementing Cap Building as one of GAA project

- Who: GAA Focus Areas, UN FAO, WB, Govs, PS
- Where:
- How:

We are able to change global environment and balancing food demand across regions
• Regionally (Provincially in South Korea) Amount of Crop Biomass determine the size of livestock farming. If it doesn’t balance each other, then may extend nationally, and further trade internationally.

• If people in too little region, UN FAO may play a role in making them meet their basal need.

✓ No direct/reduced discharge → Healthy Earth
✓ Crop-Animal Farming (CAF)→ Healthy Soil, Healthy Food & Good Health to Humans
East Asia

China (一)

Japan (和)

Russia

East Asia
Ultimate Virtue of 3 Far-East Nations

동양 세 나라의 윤리가는 가치는?

一
ONE
FIRST
SOLO

忠
ORTHODOXY
ORIGINALLITY

和
HARMONY
PEACE

China
Korea
Japan

source : 이원복 '먼나라이웃다'
More than 7M people across the nation cheered National team on the street in consecutive World Cup: 2002 KR-JN, 2006 Germany World Cup.
2010 S. Africa World Cup
Thanks for your interests