Pig Manure Management in Asia

Tetsuo Kuyama
Manager (Water Resource management)
Natural Resource and Ecosystem Services Area
Purpose of Session
Knowledge sharing of following topics on pig manure management considering the common and different situations (natural/social) in WEPA countries

• Pig industry in WEPA countries
• Impacts of pig industry to water environment
• Uniqueness of pig manure management
Pig Industry in WEPA countries (Outlook)

- 55% of global pig production (2011)
- About 580 million heads (as of live pig in 2014) in WEPA countries
- **Rapid increase of pig population** in China, Vietnam, Myanmar
- **Few exported pigs**: Most of pigs are consumed in each country. Pig production increase is supposed to be due to human population increase and change of food culture
- **Increase of large scale producer**: China, Japan, Thailand, Vietnam
- **High pig density around big cities**: China, Thailand, Vietnam, Philippine
Global Pig Production in 2011

China 46%
Vietnam 3%
Other WEPA countries 6%
USA 9%
Germany 5%
Spain 3%
Brazil 3%
Other countries 25%
Vietnam 3%

Total Production over the world: 110 million tones

Source: FAO
Number of Live Pig in WEPA Countries (2014)

- China: 580 million heads
- Vietnam: 500 million heads
- Myanmar: 100 million heads
- Philippine: 100 million heads
- Korea: 50 million heads
- Japan: 50 million heads
- Indonesia: 50 million heads
- Thailand: 50 million heads
- Laos: 15 million heads
- Cambodia: 15 million heads
- Malaysia: 15 million heads
- Nepal: 5 million heads
- Sri Lanka: 5 million heads

Source: FAO

**WEPA total:** About 580 million heads
Change in Number of Live Pig in WEPA Countries

Source: FAO
Pig meat import/export in WEPA countries (2011)

Production/Imports

Utilization/Exports

Source: FAO
## Size of Pig Industry in WEPA countries

### Share of pigs slaughtered by farm size in Thailand (1993 and 2013)

<table>
<thead>
<tr>
<th>Number of pigs slaughtered</th>
<th>Pigs slaughtered by farm size (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1993</td>
</tr>
<tr>
<td>1-500</td>
<td>73</td>
</tr>
<tr>
<td>&gt;500</td>
<td>27</td>
</tr>
</tbody>
</table>

Source: Agricultural Census and FAO

Same trend in China, Japan and Vietnam
Pig Density in Asia

Source: FAO, LEAD Project
Supposed Issues caused by Pig Industry related with Water Environment

- **Pollution load increase** from pig industry to water environment
- **Change in pattern of pollution loading** from pig industry to water environment
- **Severe negative environmental/social impact** from pig industry in the city near high pig density area in addition to pollution from domestic wastewater
Cases of Water Environmental Pollution caused by Pig Industry reported in WEPA Countries

Thailand
• According to Pollution Control Department in 1999, 23% of BOD loading in Tha Chin River (western part of Bangkok city) was caused by pig industry. In 2000, water quality at Tha Chin River became critical as the level of DO has dropped to near zero in the most part of the river. In addition, there was complaint that pig production is a cause of water pollution in Bangpakong River in the eastern region. Consequently, in 2001, PCD added the pig industry in the regulated list (source: FAO).

Philippine
• In Balanac River, which is a tributary of Laguna de Bay and Benig River in Tarlac located in Luzon, water pollutions caused by pig industry were reported, and therefore DENR investigated these rivers. In addition, river waters in Lantapan, Bukindo in Mindanao have also become polluted with E.coli and there was suspicion that the pollutants must have come from human and livestock waste (source: FAO)
Cases of Water Environmental Pollution caused by Pig Industry reported in WEPA Countries

China
• According to 12th National Five Years Plan of Livestock Pollution Prevention, 59 % of total pollution load to Lake Tai is reported to be caused by agricultural sector, mainly from livestock industry. In addition, Chinese government conducted national pollutant inventory survey in 2009 and 2010. The result of the survey in 2010 illustrated that 45% of COD load and 25 % of NH3 load were from livestock industry. Consequently, Chinese government started to intensify livestock pollution prevention from 12th National Five Years Plan.

Vietnam
• ????
How to manage pig manure?
Today’s Program

13:05-13:35
“Progress of WEPA Action Program on Pig Wastewater Management in Vietnam”
Ms. Quyenh Huong, ESI, Vietnam

13:35-13:55
Coffee Break

13:55-14:25
“Swine waste management in Thailand ”
Dr. Chao Nokyoo, Pollution Control Department, MONRE, Thailand

14:25-14:55
“Environmental management of Pig excreta in Korea”
Dr. Eugene Chung, Senior Researcher, National Institute of Environmental Research, Korea
Contents of Each Presentation

• Current situation of pig farm
• Impact of pig manure to the environment
• Issues on pig manure management
• How to overcome or improve the issues
Consideration Points in Sharing of Knowledge on Pig Manure Management in Asia

- **Waste** Management and **Wastewater** Management
- **Difference of Pollution Loading** by Different **Pig Sizes** and Different **Breeding Methods**
- **Antibiotics Use**
- **Biogas Production**
Methodology of Pig Manure Treatment in Japan (2009)

Separation of Feces (Waste) and Urine (Wastewater) at Primary Treatment Stage

According to the Ministry of Agriculture, Forestry and Fisheries, Japan, 74% of pig manure treatment facilities in Japan separate feces (waste) and urine (wastewater) at the primary treatment stage, while 26% do not.
Methodology of Pig Manure Treatment in Japan (2009)

Feces (Waste)

- Composting

Urine (Wastewater)

- Biological Treatment (use as liquid fertilizer)

Treatment Methodology at Secondary Stage

Source: Ministry of Agriculture, Forestry and Fisheries, Japan
Issues in Use of Composting and Liquid Fertilizer

Change of Agricultural Land and Nitrogen Fertilizer Consumption in WEPA Countries

Agricultural land
Consumption of Nitrogen Fertilizer

Source: FAO
### Pollution Load Unit by Different Pig Types (Thailand)

<table>
<thead>
<tr>
<th>Country</th>
<th>Pig Type</th>
<th>Manure Volume (l/head/day)</th>
<th>BOD (mg/l)</th>
<th>COD (mg/l)</th>
<th>SS (mg/l)</th>
<th>TKN (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>Breeder</td>
<td>64</td>
<td>800</td>
<td>1,700</td>
<td>900</td>
<td>350</td>
</tr>
<tr>
<td>Thailand</td>
<td>Fattener</td>
<td>24</td>
<td>3,500</td>
<td>7,400</td>
<td>4,700</td>
<td>700</td>
</tr>
<tr>
<td>Thailand</td>
<td>Nursery</td>
<td>20</td>
<td>2,500</td>
<td>5,400</td>
<td>3,000</td>
<td>350</td>
</tr>
</tbody>
</table>

Source: Pollution Control Department, MONRE, Thailand
## Pollution Load Unit by Different Breeding Methods (Japan/WHO)

<table>
<thead>
<tr>
<th>Country</th>
<th>Breeding Method</th>
<th>Manure Volume (l/head/day)</th>
<th>BOD (mg/l)</th>
<th>COD (mg/l)</th>
<th>SS (mg/l)</th>
<th>TN (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>Pig House with Water Washing</td>
<td>118</td>
<td>1,927</td>
<td>1,378</td>
<td>1,268</td>
<td>456</td>
</tr>
<tr>
<td></td>
<td>Pig House without Water Washing</td>
<td>3</td>
<td>14,848</td>
<td>7,879</td>
<td>17,576</td>
<td>7,273</td>
</tr>
<tr>
<td>WHO</td>
<td>Solid Floor/Water Washed</td>
<td>40</td>
<td>2,253</td>
<td>-</td>
<td>5,000</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Slotted Floor/Pit Manure</td>
<td>8</td>
<td>11,750</td>
<td>-</td>
<td>8,571</td>
<td>2,607</td>
</tr>
</tbody>
</table>

Source: Ministry of Land, Infrastructure, Transport and Tourism (Japan), WHO
Thank you in advance for your active discussion