Manure Management and Challenges in China

Hongmin DONG

Institute of Environment and Sustainable Development in Agriculture
Chinese Academy of Agricultural Sciences
Livestock Production in China

- China provides food for 1/5 of the world population with 9% of the world’s arable land
- 1/2 swine, 1/3 poultry, 1/5 sheep, and 1/10 dairy was produced in China
Booming development of livestock production in the past 50 years in China

Dairy, 1.0; Beef cattle, 1.0; Pig, 0.3;
Sheep and goat, 0.1; Layer, 0.014; Broiler, 0.007

FAO, 2015
Diversity -- from backyard to intensive modern farms
Manure production in China

- The manure production is around 3.8 billion tons including waste water.
- TN and TP production were 7.4 and 1.6 million tons.
- The intensive production contributed about 35%, household shared 65%, Pig shared 40%.
Take actions to promote manure utilization and control pollution

**Policy & regulation**

- 2014.01.01 Regulation on the Prevention and Control of Pollution from Intensive animal farms
- 2017.06.31 Opinions of the General Office of the State Council on Accelerating Animal manure Utilization

- Promote utilization for energy and fertilizer
- Establish a mechanism to promote the integration of crop & livestock production
- Realize green, low carbon, cycle development

**Action**: 20 billion RMB

- Use Organic fertilization in cash crops
- Subsidy for equipment purchase
- Manure utilization in Intensive farms
- 586 Major livestock production counties

**01** 养殖大县整县推进
02 非大县养殖场
03 果菜茶有机肥替代
04 农机购置补贴
7 Typical Models of Manure Treatment and Utilization

1. Full Manure Collection and Land Application
2. Composting of Solid Manure
3. Specialized Biogas Plants
4. High-Rise Manure Fermentation Bedding
5. Litter Recycling
6. Wastewater Fertilization
7. Up-to-Standard Discharge of Wastewater
Compost

Land application

Water treatment

Biogas plant
Utilization rate of animal manure reached more than 70% in 2018

Land application dominated the use of solid and liquid manure (>50%)

Only 6.5% (solid) and 20% (liquid) were applied for biogas production

DONG et al, unpublished
Conflicts between small-scale crop farming and large-scale livestock production

- Average cultivated area per crop farm is 5 mu.
- Maximum capability for manure land application is less than 50 pigs per farm.

<table>
<thead>
<tr>
<th>Items</th>
<th>China</th>
<th>Eastern</th>
<th>Middle</th>
<th>Western</th>
<th>Northeast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of farm (Million)</td>
<td>207.43</td>
<td>64.79</td>
<td>64.27</td>
<td>66.47</td>
<td>11.90</td>
</tr>
<tr>
<td>Arable land area (Million ha)</td>
<td>134.92</td>
<td>25.83</td>
<td>30.72</td>
<td>50.44</td>
<td>27.94</td>
</tr>
<tr>
<td>Average area of each farm (mu)</td>
<td>9.8</td>
<td>6.0</td>
<td>7.2</td>
<td>11.4</td>
<td>35.2</td>
</tr>
<tr>
<td>Number of farm large than 100 mu (Million)</td>
<td>3.98</td>
<td>1.19</td>
<td>0.86</td>
<td>1.10</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Dong et al., 2019
China is Exploring Professional Third Party Supporting System

- Who will pay for the facilities, and the transport costs?
- Who should receive state subsidies?
- How much subsidies needed?
- How to distribute subsidies?
# Three different service modes

## Household and Small farms
- Cooperatives
  - Government: investing in transportation equipment
  - Farmers: manure storage facilities
  - Villages: manure collection and application cooperatives
  - Villagers representatives are responsible for supervision
  - Establishing accounting system

## Medium and Large farms
### Commercial Service
- Third party company: investing in manure storage and application facilities
- Livestock farms: who produces pollution and pay for service
- Crop farms: who buy the manure as nutrients

## Huge animal company
### The Self-circulation Model
- Leading Enterprises: self-built large-scale waste treatment project
- Establishment of integration of crop and livestock Ecological system through Land Transfer,
- Demonstrate and training farms in surrounding counties
Control Potential Risk: Heavy metals +antibiotic/Resistance gene

MARA released action plans

“Standards for safety usage of feed additive (No. 2625)”, which was into force on July 1, 2018. It has greatly reduced the limitation of heavy metal in feed.

“Action for control the use of antimicrobials for animals”, No antibiotics in feed, January 1, 2020
Future improvement on manure utilization in China

- Find the Way to strengthen third-party service to promote integration of crop and animal production
- Control potential environmental impact: GHG, NH₃, ARGs.
- Establish NMP system based on full-chain monitoring network to support the inspection of EPA
Thanks