Climate Change and Livestock Production

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Outline

- Background on China animal production
- Impact of CC on animal performance
- GHG emissions from animal production
- Conclusion and Suggestion
China is the largest developing country.

Farmers account for about 65% of the Chinese population, and their family income is very low.

There are a lot of people whose income per day is less than 1 $.

China's one of the top priorities today is to enhance agricultural sustainable development and promote farmers’ living standards.
Animal husbandry has become one of the pillar industries in rural economy and an important source of raising farmers' income.

Over one third income of farmers are from husbandry in China.
- Around 47.6% of world pigs, 25.5% of chicken are raised in China.
- Animal population continues to increase in China at 10 to 23 percent per year from 1990 to 2008.
- Livestock production is a very important sector.
Impact of Climate Change
All animals couldn’t tolerate high temperature

- Animals couldn’t survive when the environmental temperature is 5 °C higher than its body temperature.
- But they could live for a long time in the environment with a temperature of 20~60 °C lower than its body temperature.
(1) Impact on production performance

- **swine**
  - For sows, feed intake in the temperature more than 25 °C reduced to 1/6-1/5 of that in temperature of 18-25°C
  - For growing and finishing pigs, the daily feed intake and daily weight gain declined significantly in high temperature

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Daily Feed intake</th>
<th>Daily weight gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 °C</td>
<td>baseline</td>
<td>baseline</td>
</tr>
<tr>
<td>32 °C</td>
<td>reduced by 60-100g/ °C</td>
<td>reduced by 35~57g/ °C</td>
</tr>
</tbody>
</table>
(1) Impact on production performance

- **broilers chicken**
  - For, the weight gain decreased at the rate of 1.5%~2% per temperature increment. When the constant temperature was more than 20°C.

- **Layers**
  - When temperature changed from 25.2°C to 33.1°C, egg weight decreased by 5.7%.
  - During temperature in range of 32~38°C, the feed intake and egg yield decreased by 4.6% and 9.5%, respectively, in concurrent with 1°C increase in temperature.
(2) Impact on reproduction of animal

- **Dairy cows**
  - 20–27% drop of pregnancy rate can occur in summer season
  - Heat stress during pregnancy slows down growth of the foetus and can increase foetus death loss

- **Swine**
  - High temperature has a tremendous effect on sows
  - A 5~6 times higher death rate was observed in sows exposed to temperatures over 33 °C
(3) Impact on disease control

- Morbidity of animals increase in high temperatures
  - Heat stress result in respiration rate increase — cow become much more susceptible to acute rumen acidosis
  - Higher incidence of mastitis during periods of hot weather

- Vector-borne infection increase in high temperatures
  - Disease vectors, such as flies, mosquitoes, may increase with the changes in rainfall and temperature, vector-borne disease increases
  - A 2°C temperature increase could benefit more possibility of an extensive spread of Culicoides imicola, which represents the major vector of the bluetongue virus.
(4) Increase drink water demand of animals

- Drinking water demand increase with temperature
  - at 10°C ambient temperature, water requirement was 3 kg/kg DM intake
  - at 30°C, water requirement will be 5 kg
  - at 35°C, water requirement will increase to about 10 kg
(5) Impact on feed supply of animal

- Feed cost increase
  - Climate changes will influence crop production and relative costs, such as costs for irrigation, especially for corn production, and for pest treatment.
  - This has enormous impacts on feed supply and feed cost
(6) Capital investment and energy consumption increase

- Capital investment on animal production facility increase
  - Highly efficient cooling system
  - Higher thermal insulation property of animal house need more money

- Operation cost increase
  - Cooling system running longer time need more energy cost
Because of many C3 plants, the rising temperature will have a negative impact on grassland plants growth;

Pastoral areas in Northern China will become more warm and dry in future; this has fallen the productivity of typical grassland;

Climate change may be also exacerbate the grassland degradation in China.
GHG emission
Agriculture accounts for 13.5% of total global GHGs
contributes about 47% and 58% of total CH$_4$ and N$_2$O
Livestock is an important GHG emission source

- CH$_4$ from enteric fermentation constitute 32% of total non-CO$_2$ emissions from agriculture in 2005.

- Accordingly, US-EPA (2006a) forecast increases of 153% and 86% in emissions from enteric fermentation and manure management, respectively, from 1990 to 2020.

- East Asia is projected to show large increases in GHG emissions from animal sources.

- Since the per-capita consumption of meat and milk is still much lower in these countries than in developed countries, increasing trends are expected to continue for a relatively long time.
GHG emission from livestock sector in China

- Livestock is an important GHG emission source.
- According to Initial Communication on Climate Change, emission from agricultural sector accounted for 15%~17% of China’s total GHG emissions in 1994.
- CH$_4$ emission from livestock contributed to around 30% of China’s total CH$_4$ emission, 64% of agricultural CH4 mission.
- In CO$_2$-e, Livestock contribute 40~50% agricultural GHG emission.
With population increase and living standards improvement, the consumption of animal products will continue to rise. In the absence of major technological breakthroughs, GHG emissions from livestock sector will continue to increase in China in the future.
GHG emission from livestock sector

Figure SPM.10. Estimated economic mitigation potential by sector in 2030 from bottom-up studies, compared to the respective baseline assumed in the sector assessments. The potentials do not include non-technical options such as lifestyle changes. (Figure 4.2)
Control CH₄ emission from dairy enteric could be win-win option

By using silage instead of corn stalk could reduce per kg milk CH₄ emission 30%.

Ratio of CH₄ energy to gross energy reduce from 7.13- 6.5.
Construction of Biogas Digesters to reduce GHG emission from manure management

- By the end of year 2009, household biogas digester had reached 30 million, with reduce GHG emission of 50 million ton of CO$_2$-e.
- Provide 10.0 billion cubic meters clean biogas for farmer.
Conclusion and Suggestion
Conclusion

- Livestock is a key sector in developing countries, it can fulfill multiple economic, social functions.
- With the circumstance of increasing population, and need for improving farmers’ living standards, livestock population will increase continuously.
- Impact of Climate change on livestock will include heat stress of higher temperatures, and changing rainfall patterns, which could translate into the increased spread of diseases, negative animal performance, reproduction as well as increase of feed cost.
Conclusion

- GHG emission from livestock takes a significant percentage and it would increase trend in the future.
- The greenhouse gas emission from livestock sector is so-called “survival emissions”.
- In order to slow down the increase rate of GHG emissions from livestock activities, we wishes that financial and technological support can be provided by international communities to protect our climate while enhancing the development of agriculture and rural area.
- Livestock can play an important role in both mitigation and adaptation.
Suggestion

- Propose launches the ASEAN+3 Animal production and climate Change project, Integrating Mitigation and Adaptation options for sustainable livestock production under climate change
- Assess the impacts of climate change on livestock systems
- Develop cost-effective Mitigation technologies from ruminants and manure management
- Provide support to set up policies for mitigation and adaptation to climate change for the livestock sector.
Thanks!