

Technology Needs for Promoting Rural Development and Mitigating Greenhouse Gas Emissions in China



YANG Xiongnian

**Deputy Director-General, Department of S&T,
Education and Rural Environment**

Ministry of Agriculture, P.R. of China

E-mail: yangxn@agri.gov.cn

Outline

- **Background**
- **Current and projected GHG emissions from agricultural sources**
- **China's efforts to mitigate GHG emissions from agricultural sector**
- **Technology needs**

Background

Basic circumstance

- ❑ **The per capita GDP in China ranks after 100th in the world**
- ❑ **About 70% of the Chinese population live in rural area, and their family income is very low**
- ❑ **There are a lot of people with income less than 1US\$ per day**
- ❑ **One of the China's top priorities is to enhance agricultural development and promote farmers' living standards**



Background

Preliminary judgment

- **Per capita GHG emission in China remains low**
- **With population growth and improvement of people's living standards, the consumption of agricultural products will continue to rise**
- **In the absence of major technological breakthroughs, GHG emissions from agricultural sector will continue to increase in China in the future**

GHG emission from agriculture sector

- **China agriculture accounted for 17% of China's total GHG emissions in 1994**
- **CH₄ emission from agricultural sector contributed to 50% of China's total CH₄ emission**
- **N₂O emission from agricultural sector accounted for 92% of China's total N₂O emission**



Activity data for GHG emissions

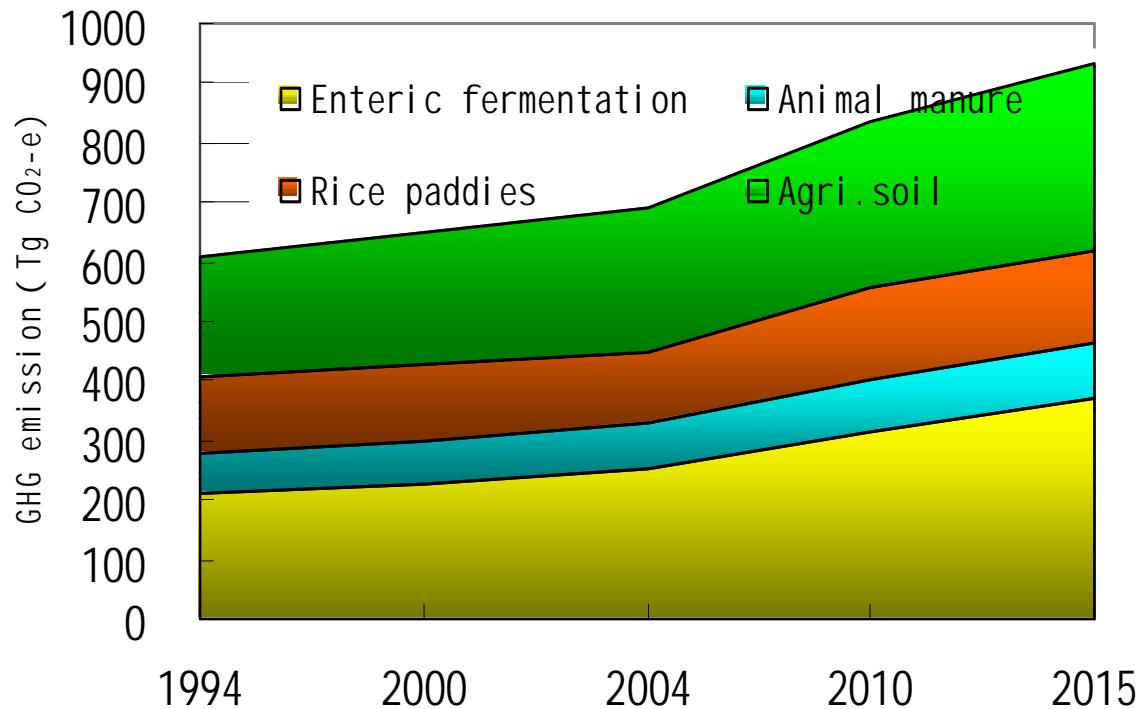
Major GHG emission sources in agricultural sector include rice paddies, livestock production, manure management and N fertilization. In 2004, China

- Rice planting area accounted for 19% of the world total**
- Year-end stocks of cattle, pigs and sheep in China accounted for 8.5%, 50% and 18% of the world totals respectively**
- Nitrogen fertilizer consumption accounted 30% of world total**

Projection of GHG emissions from agricultural sector in China

- ❑ It is expected that per capita demands for meat, egg and milk by 2015 would reach 61, 20 and 23 kg respectively
- ❑ Compared with 1994, the year-end stock of pigs, cattle and sheep in 2015 would increase 39%, 51% and 93%, respectively
- ❑ Rice paddies and nitrogenous fertilizer application would also increase

Projection of GHG emissions from agricultural sector in China



By 2015, GHG emission from agricultural sector would reach 900 Tg CO₂ equivalent, increase by 48% over 1994

The leading contributors to such increases would be livestock and fertilizer application

China's efforts to mitigate GHG emissions from agricultural sector

- ❑ Chinese government has taken a number of initiatives to ensure the sustainable agricultural development and to improve farmers' living standards, these initiatives reduced GHG emissions to some extent
- ❑ There are 7 programmes or measures which contributed substantially to GHG reduction



1. Eco-household Programme

- ❑ **Eco-household Programme focuses on biogas digester construction, with the application of solar energy, wind energy, water energy, and fuel-saving stoves**

- ❑ **The objectives are to:**
 - **improve farmer's living environment**
 - **increase farmers' income**
 - **realize the goal of environment-sound agricultural production**



Biogas digester

- **By the end of 2005, household biogas digesters had reached 17 million with a total biogas production of 6.5 billion m³, 10% of families in rural area have the opportunity to use biogas**
- **The number of large-scale biogas digesters for manure treatment had reached about 2000, with an annual biogas production capacity of 90 million m³**



Solar energy

- ❑ 28.5 million m² of water heaters by solar energy
- ❑ 13.6 million m² of passive solar heating house
- ❑ 580 thousands of solar heating ovens



2. Precise fertilization

- ❑ N fertilizer consumption in China accounted for 30% of the world total
- ❑ Fertilizer efficiency is about 30 percent
- ❑ From 2005, China initiated a program of precise fertilization based on soil measurement
- ❑ It sent out 100,000 technicians to villages and trained 50 million farmers. The programme covered 16.7 million hectares of arable lands
- ❑ Such initiative will promote the efficiency of N fertilizer and reduce N_2O emission as a result



3. Conservative tillage

- ❑ **By the end of 2005, Chinese government had invested 110 million Yuan to extend the straw mulching and no-tillage practices**
- ❑ **The area with conservative tillage reached 3.36 million hectares.**



4. Utilization of straw

- ❑ **Feeding cattle with treated straw is one of the important measures to utilize straw and control air pollution**
- ❑ **By 2005, demonstration of feeding cattle with treated straw have been practised in more than 500 counties**
- ❑ **By 2005, the total silage and ammoniated straw reached 175 and 53 million tons in China, respectively**
- ❑ **There are more than 500 projects for straw gasification and centralized utilization**

5. Recovering and protecting grasslands

- **From 2000-2005, the government invested over 9 billion Yuan**
 - **In implementing projects to recover natural grasslands, to establish variety breeding bases, to build fences, and to control pest and rat**
 - **by 2005, total remaining artificial grassland area has reached 13 million ha, total fenced grasslands covered 33 million ha, and about 20% of usable grasslands have been banned for grazing or used on rotational basis**

6. Eco-agriculture

- ❑ **China launched an Eco-agriculture Demonstration County Campaign in 1994**
- ❑ **By the end of 2005, more than 400 demonstration counties had been established**
- ❑ **Water and soil erosion control rate reached 73.4%, land desertification control rate was 60.5%, forest coverage was increased by 3.7%, and area of straw returned to farmland reached 49% in those counties**

7. Fully promotion of “New Countryside”

- ❑ Chinese government in early 2006 called for nationwide efforts in building new countryside, which will promote coordinated social and economic development and harmony between human society and nature
- ❑ To build new countryside includes: construction of infrastructure, energy conservation, grassland recovery and construction, use of renewable energy, dissemination of new technologies, capacity building and training of farmers
- ❑ The application of cost effective and environmental sound technology would contribute to mitigating the increasing rate of GHG emissions from agricultural sector, and to the increase of carbon sinks as well

Technology needs for further mitigating GHG emission from agricultural sector

- ❑ Mitigation of GHG emission is additional burden for farmers and China's agriculture
- ❑ With severe shortage of arable lands and vulnerable ecosystems, it seems to be rather difficult for China alone to achieve a “win-win” solution
- ❑ Technical innovations, technology transfer and cooperation are definitely necessary
- ❑ China hopes that financial and technological support can be provided in advanced production technology, technology for increasing C sink and biomass utilization

Technology needs :

Advanced production technologies

- Technologies in variety selection and breeding of high-yield livestock and crops**
- Technologies for manure treatment and utilization**
- Environment-friendly fertilizers and**
- Fertilization techniques, including precise fertilization technology, etc.**

Technology needs :

Technology for increasing C sinks

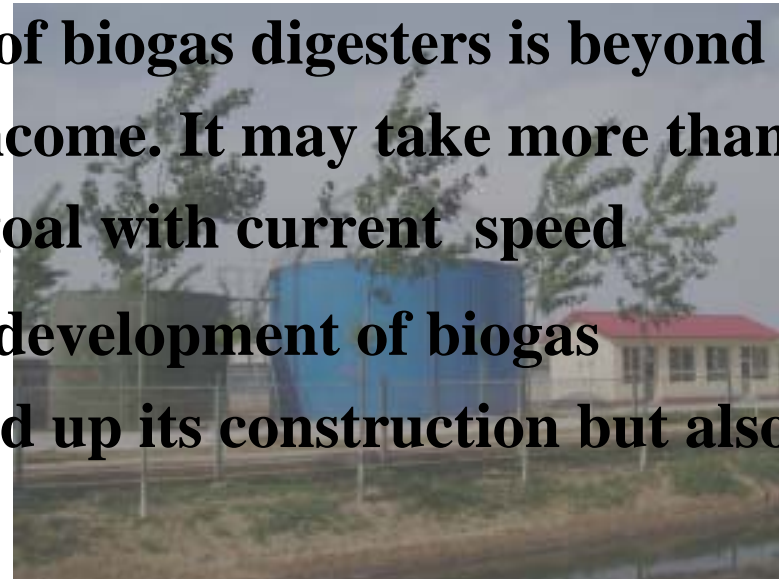
- Technologies and machineries for returning crop straw to soil**
- No-tillage sowing and weed eliminating technologies**
- Techniques and technologies to combat grassland degradation and desertification; and to control grassland pest and rat**

Technology needs : Biomass utilization

- ❑ Technologies on solidification, gasification and power generation of crop straw**
- ❑ Technologies to produce hydrogen-rich gases with agricultural residues**
- ❑ Technologies to convert biomass to liquid fuels**
- ❑ Technologies on land application of biogas residue**
- ❑ Technologies on pollution control during the process of converting biomass to clear energy**

CDM would speed up the construction of biogas digesters

- ❑ **Biogas digester is an effective measure to provide clean energy to control air pollution and GHG emission , to promote agricultural production and to improve living quality in the rural area**
- ❑ **Development of biogas digester mainly depends on the financial subsidies. Construction of biogas digesters is beyond farmers ability, because of low income. It may take more than 50 years to achieve the planned goal with current speed**
- ❑ **We wish to introduce CDM into development of biogas digesters. This will not only speed up its construction but also reduce GHG emissions**



Conclusion

- ❑ **GHG emission from China's agricultural sector accounts for a big share of China's total emission, but it belongs to 'survival emission' and will continue to grow in the foreseeable future**
- ❑ **A series of measures and actions have been taken, which has reduced GHG emissions from agricultural sector to some extent. China is still encountering barriers in financial resources, technologies and public awareness, etc., if further reduction of GHG emissions are needed**
- ❑ **China strongly wishes that financial and technological support can be provided through international cooperation. We believe this will promote China's development in agriculture and rural area and promote the protection of global climate**

Thanks