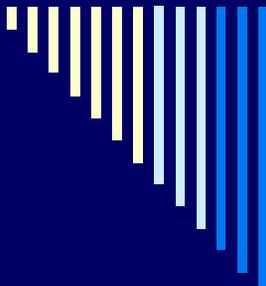


Development Status and Trends of Agricultural Biomass Energy in China

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2008 · Bangkok



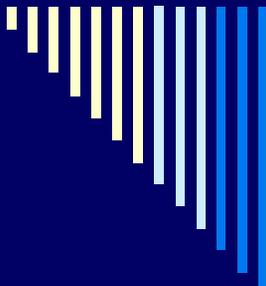
Contents

- ◆ **Introduction**
 - ◆ **Resource potential**
 - ◆ **Status of Development**
 - ◆ **Problems Existing**
 - ◆ **Development Trends**
-

Introduction

- **Exploration of clean and renewable energy has become one of the urgent issues in China's energy industry.**
 - Being a significant consumer of energy resources, the energy supply of China consists mainly of fossil fuels like coals, petroleum and natural gas, which are limited in storage and bring great pressure to environmental ecology, restricting the sustainability of social development.
- **Biomass energy is environmental friendly and renewable.**
 - Relying on the abundant, wide distributed resources, and some mature utilization technologies, China has great potential for the development of agricultural biomass energy.
- **The growth of agricultural biomass energy will help ensure national energy security, improve ecological environment, expand the function of agriculture, better farmer's income and promote the sustainable development of economy.**



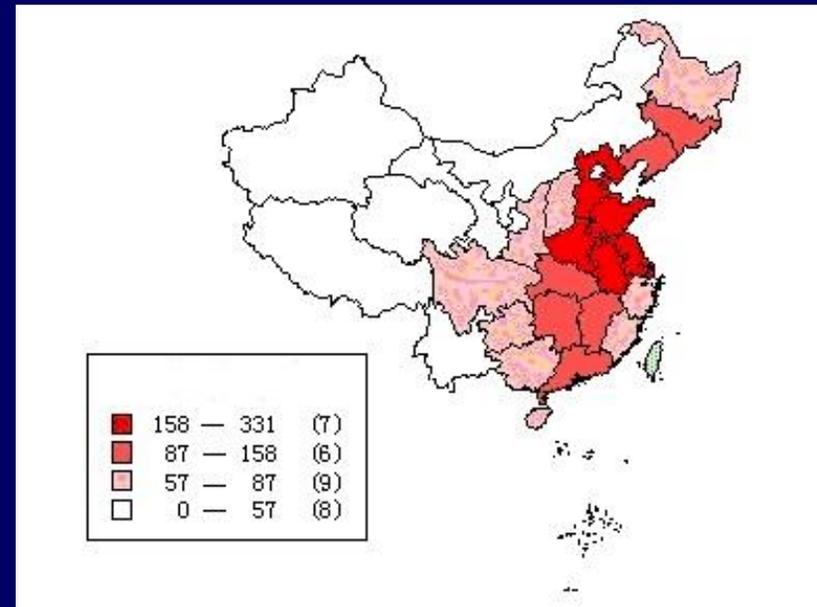


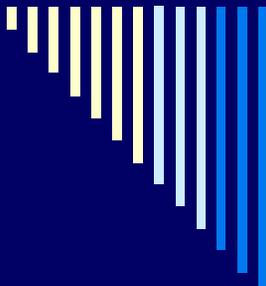
Resource potential

- The agricultural biomass of China including as below
 - Agricultural straw
 - Energy crops
 - Animal manure
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Agricultural Straw

- Massive in agricultural production, China's output of straws was about **600 million tons/year**. Except for the use for fertilizer, feeds, base materials and raw materials for paper making, about **300 million tons** of straw, equivalents to **150 million tons** of standard coals, are available for energy production.
- The straw resources are mostly distributed in main grain production areas, e.g.
 - Hebei, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Jiangsu, Henan, Shandong, Hubei, Hunan, Jiangxi, Anhui, Sichuan and Yunan
 - Considering the cost of straw collection, provinces of high unit area production are specified (Fig. 1). They are Shandong, Henan, Jiangsu, Anhui, Hebei, Shanghai, Jilin and Hubei in order of yields.





Energy crops

- Energy crops refers to herbaceous or woody plant that grown specially for energy use. Energy crops with great prospect in China are as below,
 - Sweet Sorghum
 - Tubers e.g. cassava, sweet potato
 - Sugarcane.
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Sweet Sorghum

- A variety of sorghum, sweet sorghum is drought, flood resistant and saline-alkali tolerant. Besides the grain, about 4 tons of stems (17% sugar) per 667 m² can be harvested.
- Present growth of sweet sorghum in China is in small scale and scatters in Beijing, Tianjin, Hebei, Inner Mogolia, Henan, Shandong, Liaoning, Jilin, Heilongjiang, Shaanxi and Xinjing.



Cassava

- The planting area of cassava reached 9 million 667 m² and 11 million tons of cassava were produced in 2005.
- Guangxi is the dominant province growing cassava,. Cassava is also grown in Hainan, Guangdong, Fujian, Yunnan, Guizhou and Sichuan provinces of China.



Sweet Potato

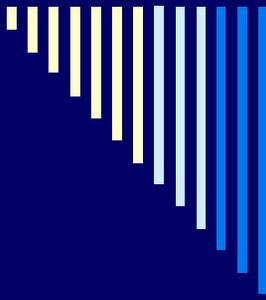
- With **75 million** 667m² planting, China produced more than **100 million** tons of sweet potato in 2005. About one quarter of the sweet potato was lost in storage and transport. In the remaining, about 15% is used for directly eaten, 45% for further processing, 35% for feed use and 5% in other ways.



Sugarcane

- Sugarcane is an annual ratoon plant in tropical and subtropical zone, preferably between southern and northern latitude $10^{\circ} \sim 23^{\circ}$. The primary use of sugarcane is sugar production.
- During 2005 and 2006, 18.21 million 667m^2 of sugarcane were grown mainly in 9 southern provinces like Guangxi, Yunan, Guangdong, Hainan and Fujian, producing 65.895 million tons of sugarcane and 2.64 million tons of molasses.





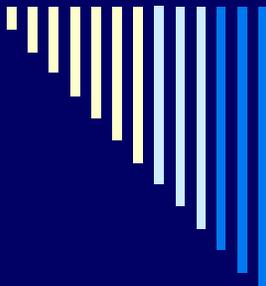
Reserved Land Resources

- China has plentiful reserved land resources, of which 100 million 667M^2 can be used for energy crops growth. According to the statistics, unutilized land of China amounted to 3.68 billion Mu, accounting for 26% of the total.
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Animal Manure

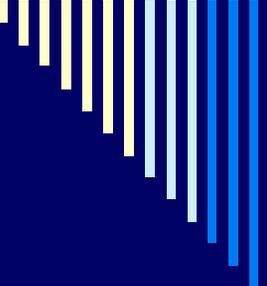
- About **3.91 million** livestock farms, including pig, cattle, and poultry farms were hold in 2005, with 570 million capita on hand in pig unit. The farms output 1.12 billion tons of animal manure, which can theoretically produce 6.7 million m³ of biogas (equivalent to 50 million tons of standard coal).
- Number of large and middle scaled farms (over 3000 capita in pig unit) was about **11952**, raising 7528 capita in pig unit, producing 142 million tons of animal manure.





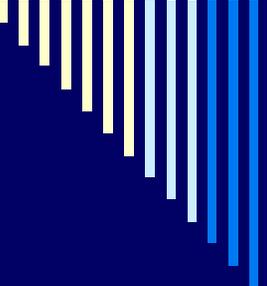
Status of Development

- Generally, the government has attached great importance to the exploration of biomass energy in recent years.
 - Measures were taken to promote the development of biomass energy: *Renewable energy law of PR China* decreed, issued *Suggestions to implement of financial support to the development of biomass energy and biochemical engineering* and related measures
 - over 20 national or industrial standards were established regarding rural biogas, overall utilization of straw resources and fuel ethanol
 - investment was strengthened, technological achievements were made and biomass industry gradually grow.
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Steady development of biogas industry

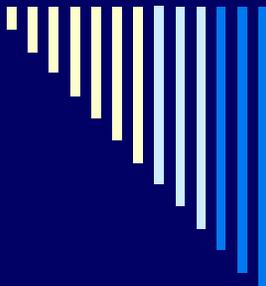
- The number of rural biogas consumers has amounted to 18.07 million households till 2006.
 - Biogas plants based on livestock farms reached 3556, producing 7 billion m³ gas, which equivalent to 5 million tons of standard coal.
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Energy utilization of straw takes effect

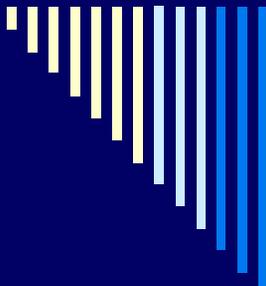
By the end of 2006,

- 189 million firewood-saving stoves were in use.
 - 539 central supply systems for straw gasification have been set up.
 - Power generation from biofuel has gained its development in contain scale, for example, many sugar manufactures make use of bagasse for power generation with total installed capacity of 800 MW. Also good trends emerged for the research, production and development of briquetting fuel technology.
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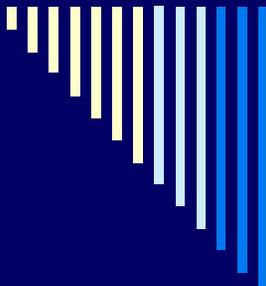
Liquid biofuel in a bit scale

- Fuel ethanol demonstration plants that taking aged grain as raw material has been built in 6 provinces, with annual gross throughput of 1.02 million tons.
 - Progress on non-food energy crops have been made as well. a series hybrid variety of sweet sorghum was breded, and demonstration base of industrial growth was established. Several high quality varieties of cassava, whose output per Mu exceeding 3 tons were introduced and cultivated. Strains that suitable for sugarcane liquid fermentation and active dry yeast were screen successfully.
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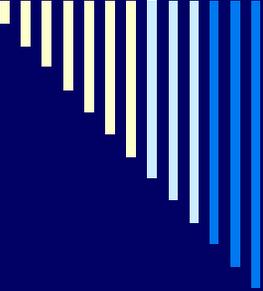
Problems Existing

- ❑ Lack of good understanding from Grassroots
 - ❑ Poor ability of independent R&D
 - ❑ High cost, the cost of most biomass energy technology is higher than that of fossil fuel, if neglecting the impairment to environment and ecology by fossil fuel.
 - ❑ Improvable supporting policy
 - ❑ Poor investment
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Development Trends

- The trend of biomass energy in China is to convert agricultural biomass to clean, efficient and usable energy. Specifically the fields worth intensive development including,
 - firstly develop rural household biogas and shape fuel technology to supply rural residents with clean and high quality living energy
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Development Trends(cont`d)

- secondly develop biogas plants based on livestock farms and agricultural processing to provide biogas or power to surrounding area, overcome the water pollution caused by animal manures and organic wastewater
 - Thirdly adopt large scaled utilization technology, such as distributed power generation, combined heat and power generation to replace fossil fuel and supply power to some non-electricity countryside
 - fourthly take use of waste grassland, saline land and other unutilized land resources for energy crops growth, set up raw materials supply base for ethanol fuel and bio-diesel production to relax the dependence on petroleum import.
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A scenic photograph of a sunset over a field of pine trees. The sun is low on the horizon, creating a warm, golden glow in the sky. The trees are silhouetted against the bright light, with some branches reaching into the frame from the top corners. The text "Thanks for your kind attention!" is overlaid in a bright green, sans-serif font across the middle of the image.

Thanks for your kind attention!