

COMPETE project



Bio-energy Development and Utilization in China

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Outlines



- ◆ Background
- ◆ Bioenergy development
- ◆ Barriers and lessons
- ◆ Future national plan



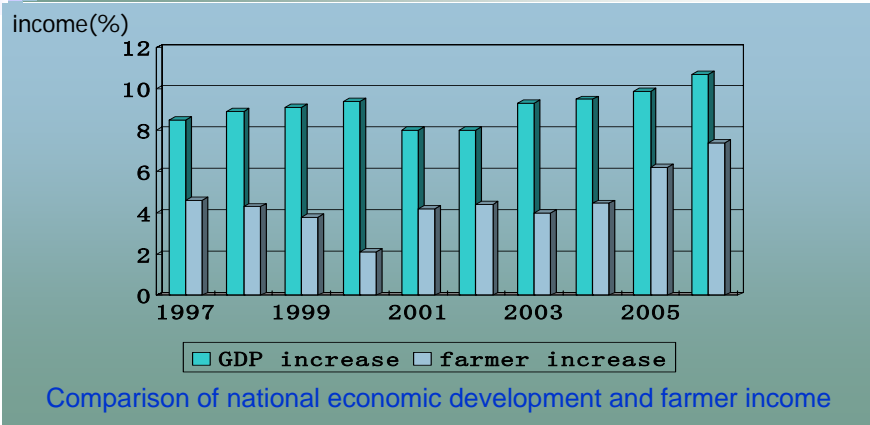
1. Background

Importance of Bioenergy development

- Rural area livelihood
- Environment protection
- Energy security

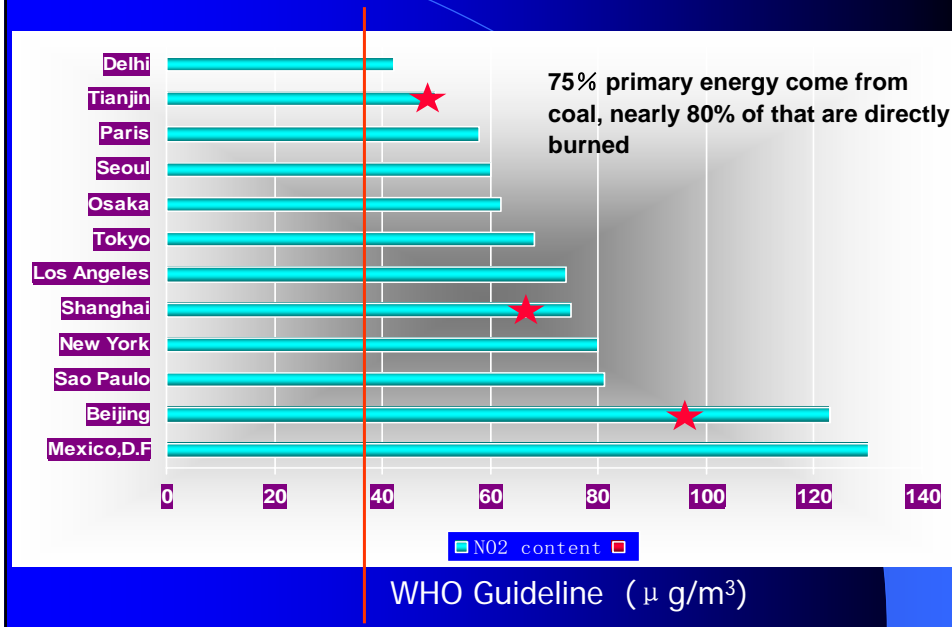


1. Background

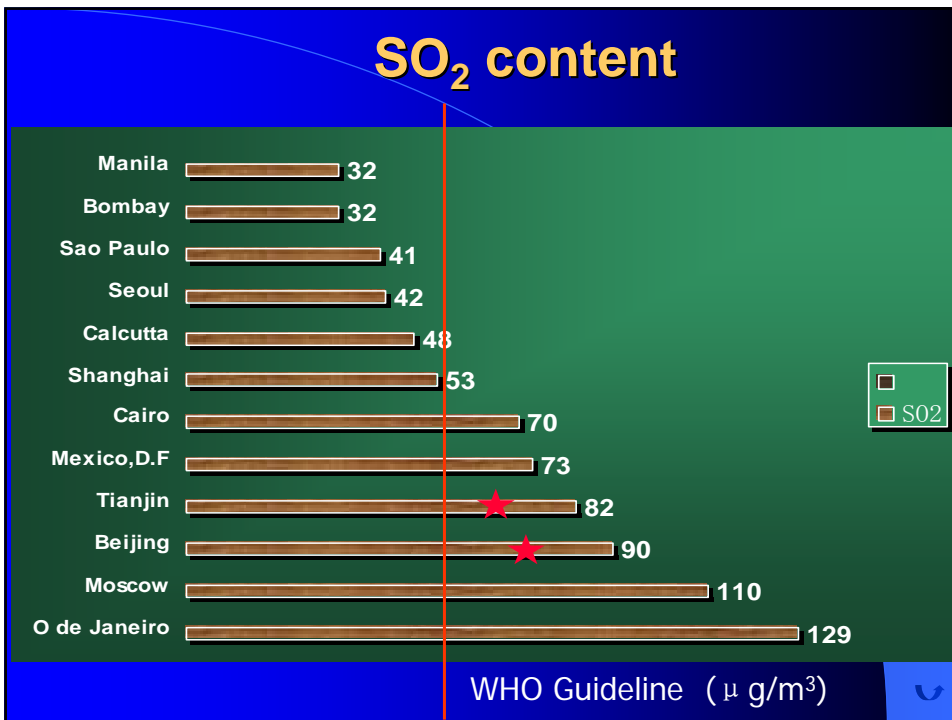


Nearly 60% of rural household energy consumption depend on firewood

NO₂ content

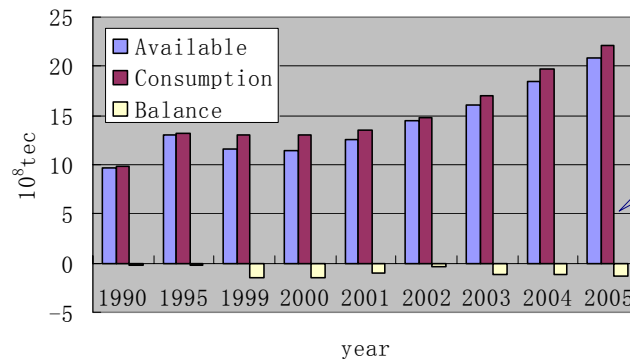


SO₂ content





1. Background



Oil import about 140 mt in 2005, take accounts of 40% of oil consumption

Overall Energy Balance in China



1. Background

- National strategy to put bioenergy as the prior option for sustainable development
- Huge potential reserves of biomass resource. Crop straw 0.6 billion t each year could be used as bio-energy resource

*In January 1, 2006, China first **“Renewable Energy Law”** took into effect and stated renewable energy exploration and utilization as the national energy development priority.*



2. Biomass utilization



Approach for Biomass >> Bioenergy

- Direct combustion >> Electricity generation
- Gasification >>> Methane
- Liquefaction >>> Bio-ethanol, and bio-oil



2. Bioenergy utilization

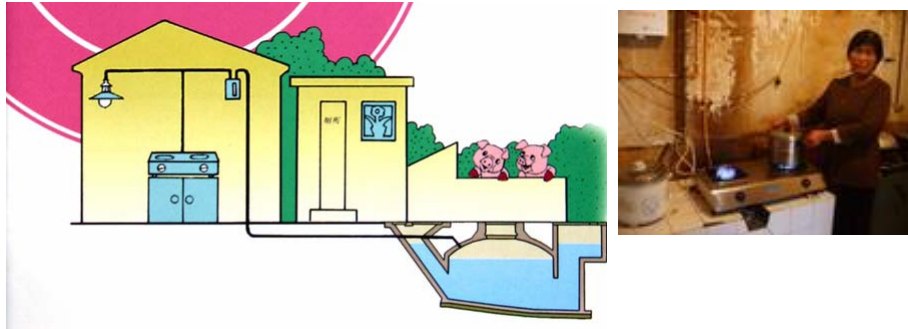


Three emphasizes types on Bioenergy utilization (2003)

	Types	10 ⁴ tce	proportion
Power generation	Garage, agricultural waste	490	41.3%
Boi-gas	Industrial methane project	10.8	
	Poultry methane project	7.4	
	Household methane	586.2	49.5%
	Straw gasified	5.1	
Boifuel	Ethanol—stale grain	85.8	7.2%



2. Successful case--Household methane



**Nearly 12 million household benefit from the methane project;
Government set up demonstration village to disseminate the technique**



2. Problems with fuel-ethanol

Fuel-ethanol industrialization in china

	Plants/company	Yield 1000t/y	raw material
1	CR Alcohol Plant	100	corn
2	Jilin Fuel Ethanol C. L	600	corn
3	Tianguan Group	300	Corn and wheat
4	Anhui BBKA GROUP	320	Corn
5	GD Hualing Group	200	Cassava & sugar cane
6	GX Sorth Sugar Plant	500	Wastes of sugarcane
7	GX GuiGang Co.Ltd	200	Cassava
8	demonstration projects	20	Sweet Sorghum
	Total	2,240	

At present, 1.02 million t/y of the fuel-ethanol was produced by wheat and corn; 0.2 million t/y was produced by none food material.



3. Lessons learned: food >> fuel-enthonal



- **Four bioethanol factory invested by state operated in 2001, total production capacity is about 1 million tons. The major biomass resource is stale grain.**
- **As the beginning, stale grain is the major resource to rely on and government leave some extent subsidy to promote the activity.**
- **As the strong demand on energy, many regions show interested to share the bioethanol profit, but there is no enough stale grain for long-term fuel-ethanol producing.**



3. Lessons learned



Balance food and bioenergy

- China's corn price is steeply rising, due to the demand from various bio-fuel projects
- Government issued to halt approval of any new facilities to convert corn into ethanol except already running factories.
- The country will concentrate on bio-energy technologies based on non-grain materials, Major crops are sweet sorghum, sugarcane, cassava, crop straws.....





3. Barriers

Limitation on bioenergy development

- Still need more advance techniques support
- Difficult on biomass collection and transportation
- Electricity and natural gas are accessible in urban area
- Need more policy and capital support from government



4. National Plan

Boienergy Development Principle

- Balance land use between food and energy crops, and explore abandon land--salina、 floodplain、 bottomland、 wasteland for energy crops
- Combination of industry self-development and government support
- More attention to develop or introduce high-techniques to improve energy-use efficiency for production process





4. National Plan



National long-term development plan for renewable energy

types	2010	2020
Electricity by bioenergy	5.5 m KW	30 m KW
Methane production	19 billion M3	40 billion M3
Boifuel production	Liquid 2 million t Solid 1 m t	Liquid 10 million t Solid 50 mt



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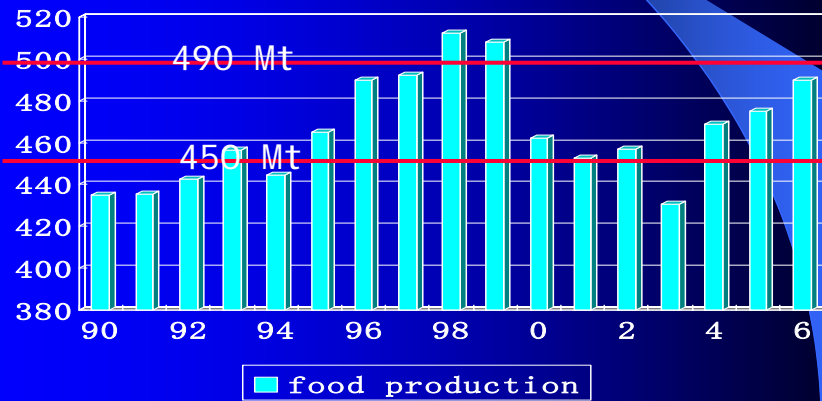
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Thank you!

Food Production

Million ton



Available land for planting sweet sorghum

- Salina 10.2 million hm²
- Floodplain 49.2 million hm²
- Wasteland 18.2 million hm²
- The land of Planting Sorghum 0.84 million hm²

Techniques for Fuel-ethanol Production

A. Solid Fermentation

Demonstration of the industrialization in the Heilongjiang Province, northeast of the China. The name is: Heilongjiang Huachuan 4E Fuel-ethanol Co. Ltd in the Huachuan county Heilongjiang province.

Yield of sweet sorghum: 80t/ha

The fuel-ethanol Yield: 5000t/y ;

The cost of the fuel-ethanol: 3800Yuan/t;

The market Price: 4300~4600Yuan/t;

B. Liquid Fermentation

Demonstration of the industrialization in the Shandong Province, middle part of the China. The name is: Shandong Jingzhi Alcohol group in the Anqiu city Shandong province.

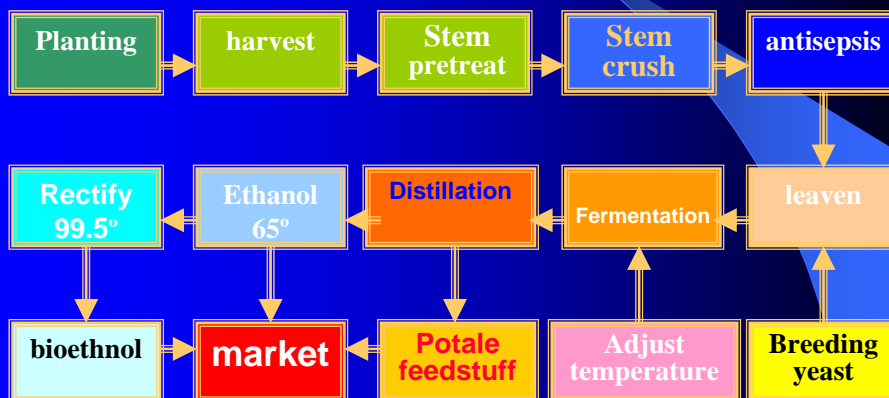
Yield of sweet sorghum: 60t/ha

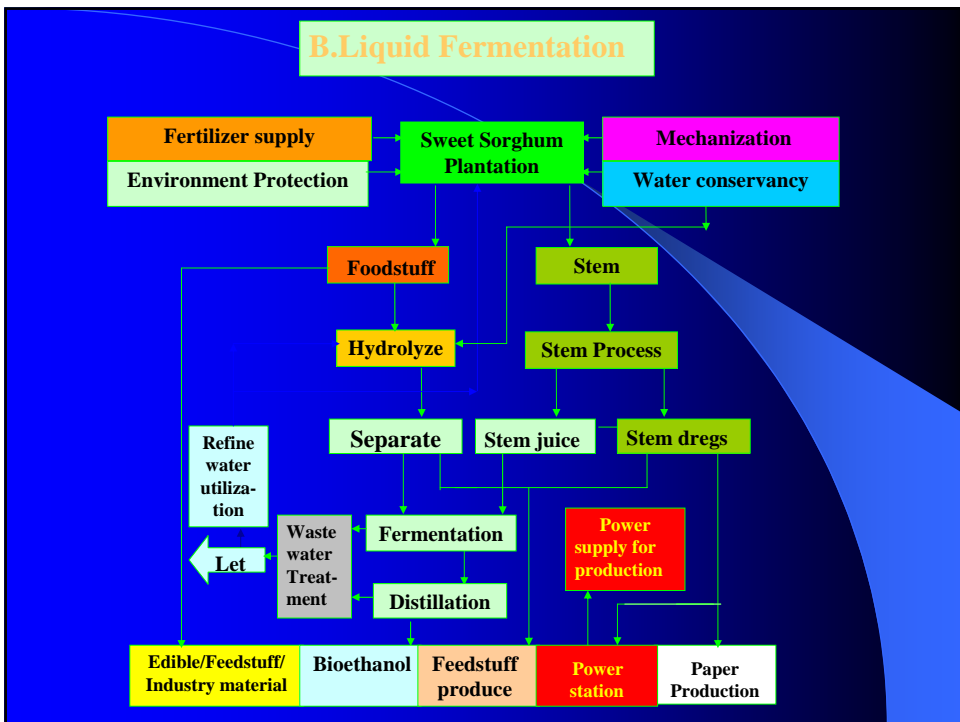
The fuel-ethanol Yield: 400t/y ;

The cost of the fuel-ethanol: 3900Yuan/t;

The market Price: 4300~4600Yuan/t;

A. Solid Fermentation





Sweet sorghum plantation in Shandong Anqiu-2004



Sweet sorghum plantation in Huhehaote

