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# Outlook of COFCO & China Non-grain Fuel Ethanol



## Fuel Ethanol Producing Enterprises & Their Layout in China



Note: Fuel ethanol promotion has not covered white areas in the chart.

## Production & Sales of Chinese Fuel Ethanol Enterprises in 2006

Name	Approved Capacity (thousand tons)	Production (thousand tons)	Actual Production (thousand tons)	Targeted Sales Area
<b>Cofco Zhaodong</b>	100	400	140	Heilongjiang Province (only)
<b>Jilin Fuel Ethanol</b>	600 first stage 300	500	380	Jilin & Liaoning Provinces(only)
<b>Henan Tianguan</b>	300	450	470	Hena Province, 4 cities in Hebei and 9 cities in Hubei(only)
<b>Fengyuan Bio-chemical</b>	320	320	330	Anhui Province, 5 cities in Jiansu, 7 in Shandong, and 2 in Hebei
<b>Cofco Guangxi</b>	200	200	Preparing	Guangxi

**Ethanol Production by Cofco in 2006 was 470,000 tons, 35% of the national total of 1.33million tons.**



## Outlook of China's Fuel Ethanol Development

### Facts about Per Capita Arable Land & Grain Possession

China's per capita arable land is only 1.4 mu, 1/4 of the international average of 5.5 mu.

China's per capita grain possession is 318kg, only 1/4 of that in America—1,213kg.

Based on these facts, China adopted the principle of No Competing for Grains with People and for Land with Grains in order to achieve sustainable development.

### Climate & Altitude

China's climate ranges from **frigid and temperate zones** to tropical zone and its annual **rainfall** varies from less than 100mm to 2400mm in different areas.

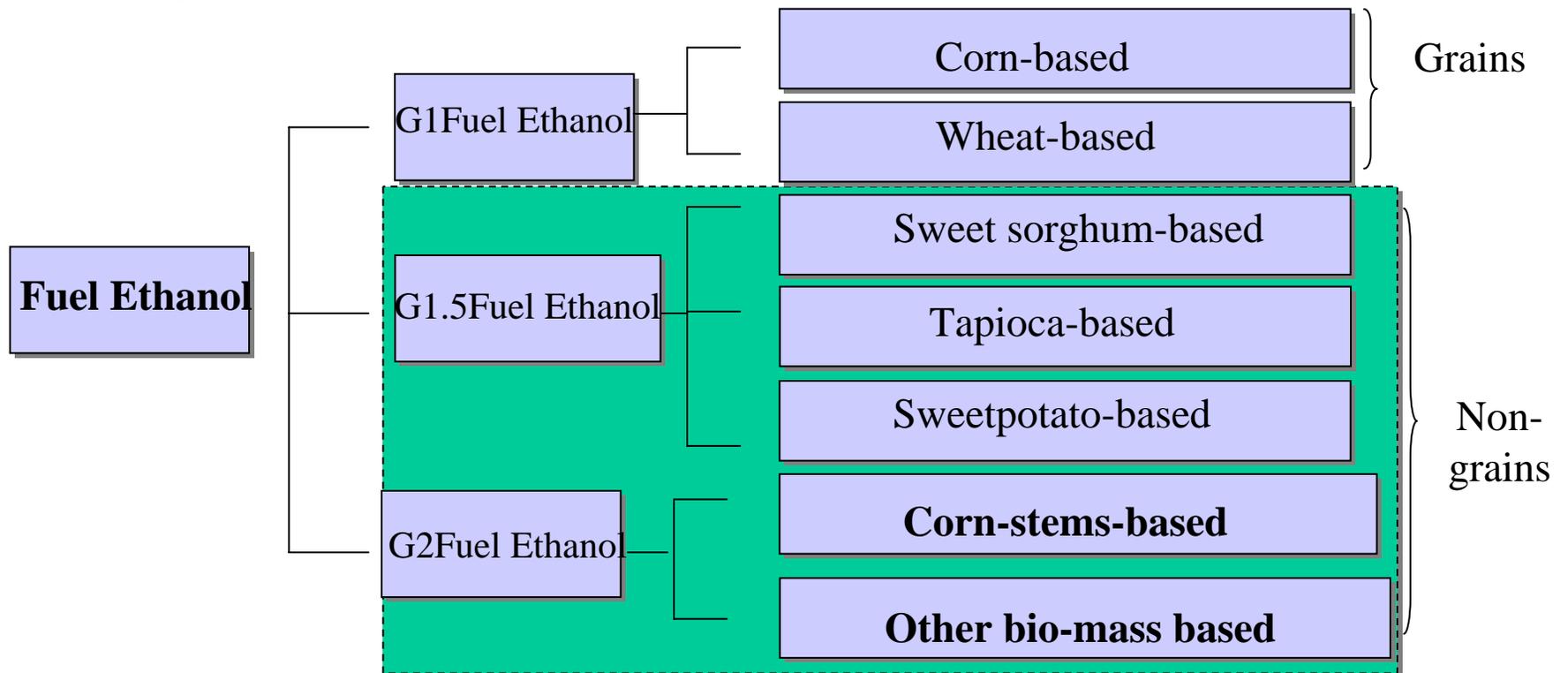
Its altitude differs from the one of World Roof to 158m negative.

Therefore, it proposed the principle of development with multi-material.



## Options for Fuel Ethanol Material

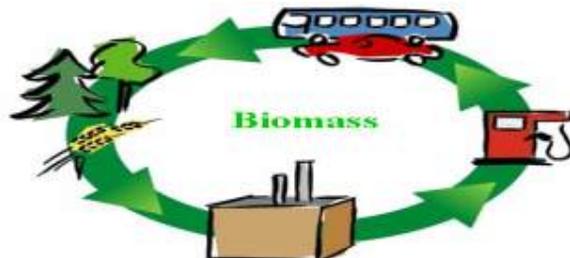
Considering the conditions in China, the key area in future development will be non-grain-material-based fuel ethanol.



I. China has abundant potential resources for fibre-based ethanol. Data in MOA shows that China had 600million tons of stems in 2006, half of which can be used as energy supply besides as fertilizer, animal feed and industrial material for paper-making etc. Its energy production equals to that produced by 150million tons of standard coal.

Fibre Quantity in China

II. Progress has been made in the research and development of China's fibre-based ethanol technology. Cofco has worked with Danish companies to set up pilot equipments with an annual production of 5million tons. BBKA also set up pilot equipments with an annual production of 3million tons.



农作物	产量 (万吨)	谷草比	秸秆量 (万吨)	折标煤系数	折标煤量 (万吨)
稻谷	18523.00	0.623	11539.83	0.429	4950.59
小麦	10221.00	1.366	13961.89	0.500	6980.95
玉米	11199.00	2.000	22398.00	0.529	11848.54
其它 杂粮	1669.00	1.000	1669.00	0.486	834.50
豆类	1787.50	1.500	2681.25	0.543	1455.92
薯类	3262.00	0.500	1631.00	0.486	792.67
油料	2250.30	2.000	4500.60	0.529	2380.82
棉花	476.80	3.000	1430.40	0.543	776.71
甘蔗	6541.70	0.100	654.17	0.441	288.49
合计			60466.14		30309.19

The above data are from MOA and State  
Administration of Forestry

## Three Technical Bottlenecks during the Industrialization of Fibre-based Ethanol Production

- I. The process of bio-mass utilization like stems is to degrade polysaccharid , i.e, cellulose and hemicellulose into monosaccharide such as glucose and xylose, and then transfer them into the target products. Ethanol is the most successfully commercialized micro-biotical fermented product.
- II. But the fibre-based ethanol technology faces with the following three bottlenecks:
  1. inefficient bio-mass pre-processing technology for stems;
  2. high cost of degrading cellulose into glucose;
  3. and lack of micro-fungi that can efficiently produce ethanol out of pentose and hexose.
- III. The Chinese government is actively promoting the prototype project in order to conquer the technical difficulties as soon as possible, to increase the competitiveness of fibre-based ethanol to the similar level of energy plants gradually, and thus to create preferential conditions for scale production and comercializaion.

Cofco aims to overcome the above technical bottlenecks and to realize the goal of industrialized production in 2012.

## Analysis of China's Non-grain Materials (I)

### Unit Ethanol Production of Different Feedstock in China

Materials	Material Consumption/ Ton of Fuel Ethanol (Ton)	Starch or Sugar Contents	Yeild per mu	Arable land Needed/Ton of Fuel Ethanol(mu)
Corn	3.22	64%	0.4	8.05
Wheat	3.9	60%	0.31	12.58
Rice	3.93	54%	0.42	9.36
Tapioca	7	25%	2	3.5
Cane	14.9	12.50%	4.57	3.26
Sweet Potato	8.6	20%	2	4.37
Sweet Sorghum	12.5	16-22%	6	3.1
Molasses	4.50	42-50%	13.71	9.78

## Analysis of China's Non-grain Materials (II)

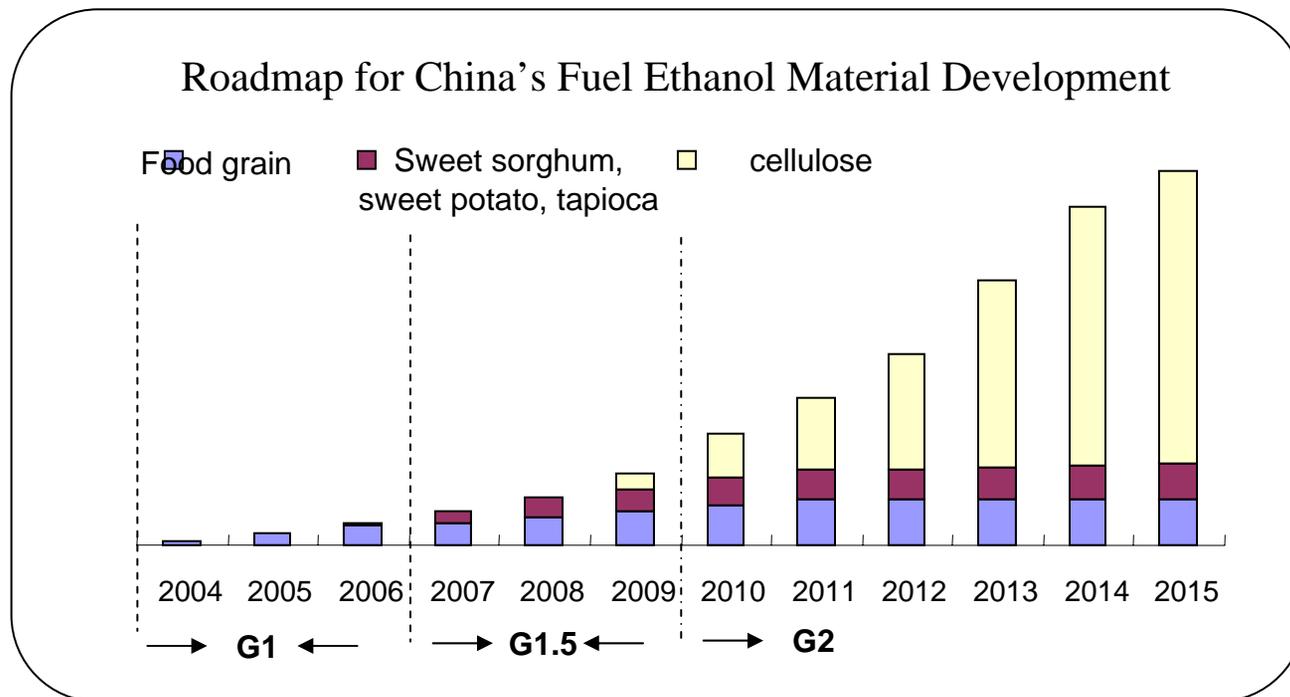
### Energy/Production (E/P) Ratio of Different Agricultural Plants

	<b>E/P Ratio</b>	<b>Notes</b>
Corn-based Ethanol	1 1.26-1.3	The data is given by US Energy Bureau, USA and UC Berkeley.
Tapioca-based Ethanol	1 1.3-1.4	Tapioca can grow in barren areas and need less fertilizer and irrigation than grain products like corn. In this sense, little energy consumption occurs in its plantation.
Sweet sorghum-based Ethanol	1 1.65	Sweet sorghum features good adaptation to barren land, flood and drought with less input during plantation.
Cellulose-based Ethanol	1 10	The result of the cellulose-based ethanol E/P ratio was released by UC Berkeley in 2006.

As demonstrated in the above figure, the E/P ratio of non-grain agricultural products is generally lower than that of grain products, especially that of cellulose-based ethanol, which is the lowest and the most economic one.

## Roadmap for China's Fuel Ethanol Material Development

To stabilize grain-based ethanol production;  
to prioritize the production of non-grain-based ethanol, such as potatoes and sweet sorghum;  
And to increase the technical level of cellulose-based ethanol production.



Scale production based on different materials (such as G1.5, G2) will start according to the variation of quantity and technical progress.

*Thank You*

