

Biomass Utilization in China

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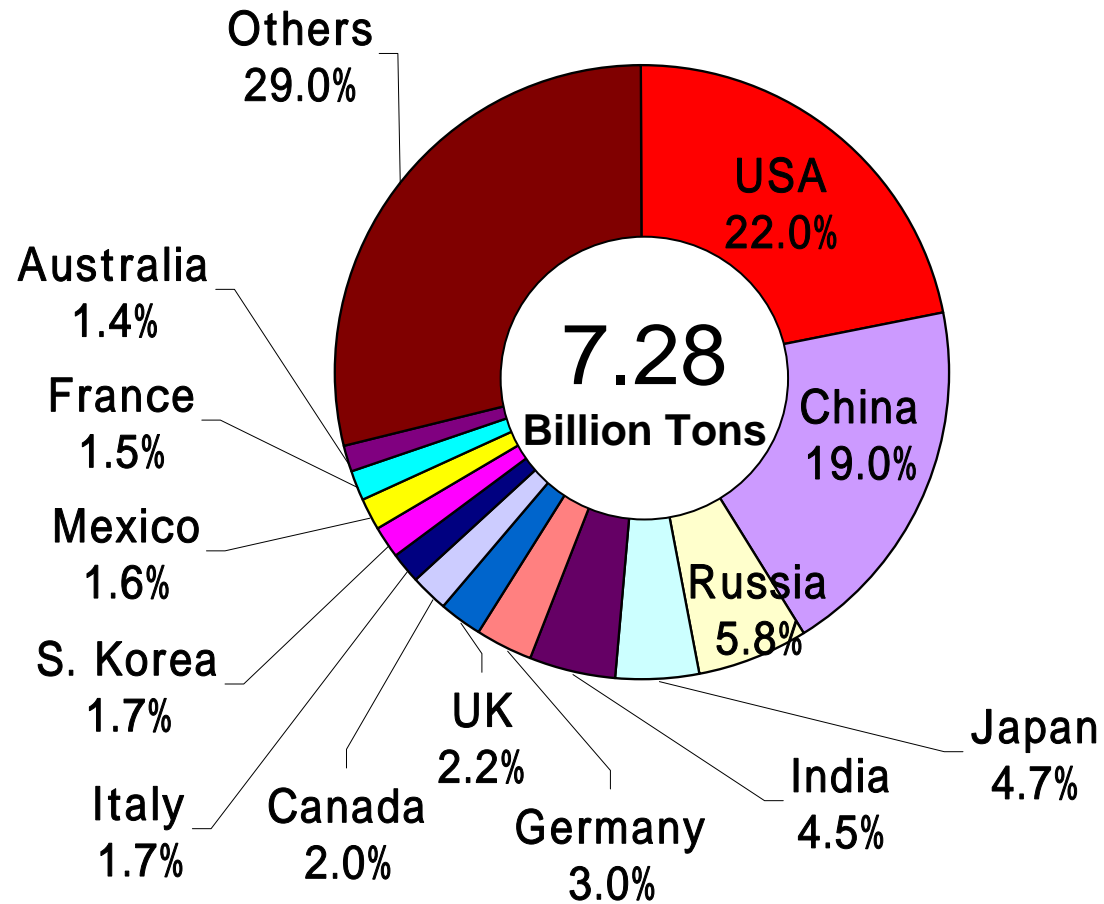
The 5th Biomass-Asia Workshop
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Guangzhou, China



Presentation Outline

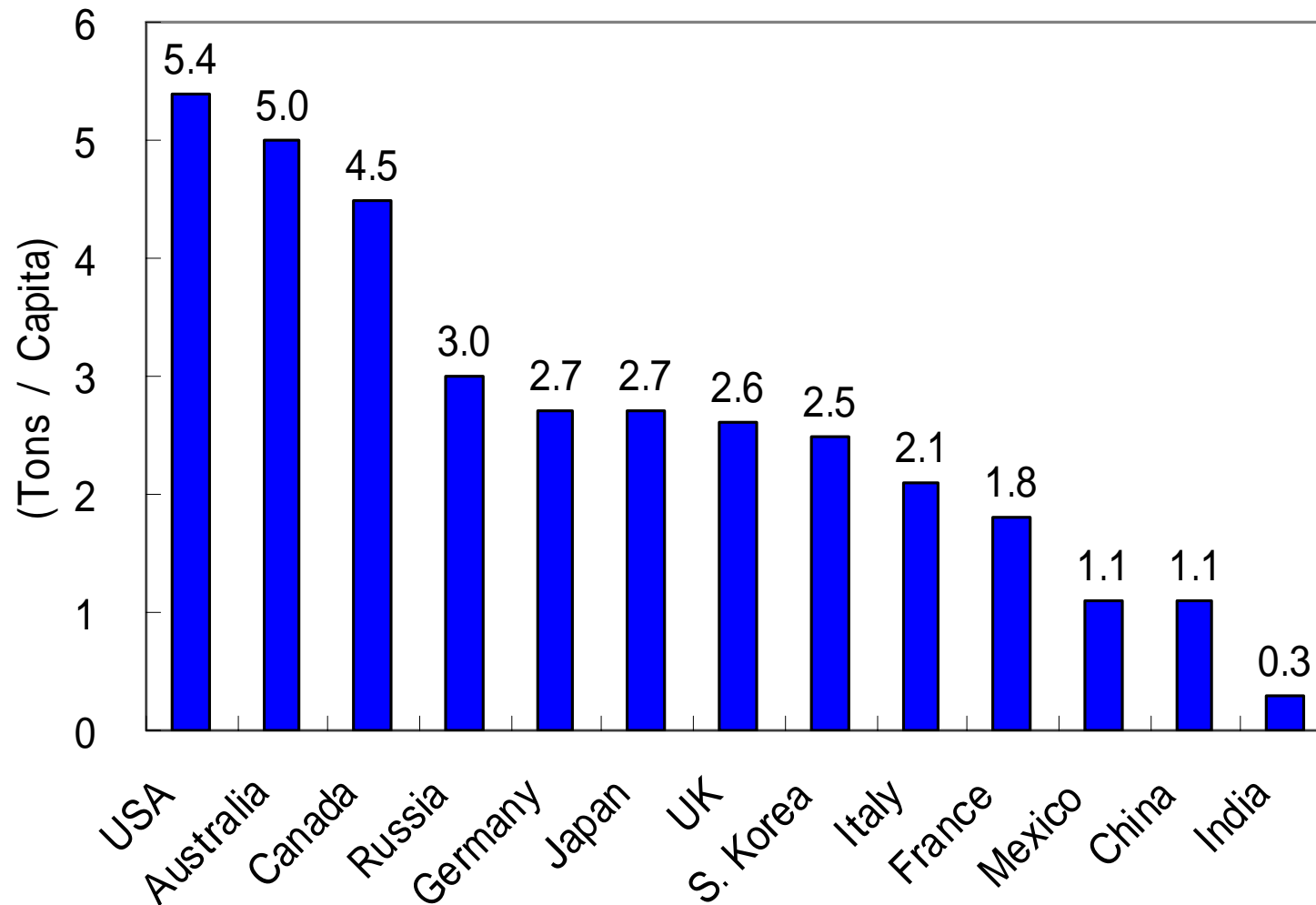
1. Energy Situation in China
2. NDRC's Biofuel Plan in China
3. Bioethanol Production/Plan in China
4. Biodiesel Production/Plan in China
5. Biomass Feedstock Composition
6. Agricultural Waste in China
7. Biobutanol
8. Biomass Utilization Model in China

CO2 Emission in the World (2005)



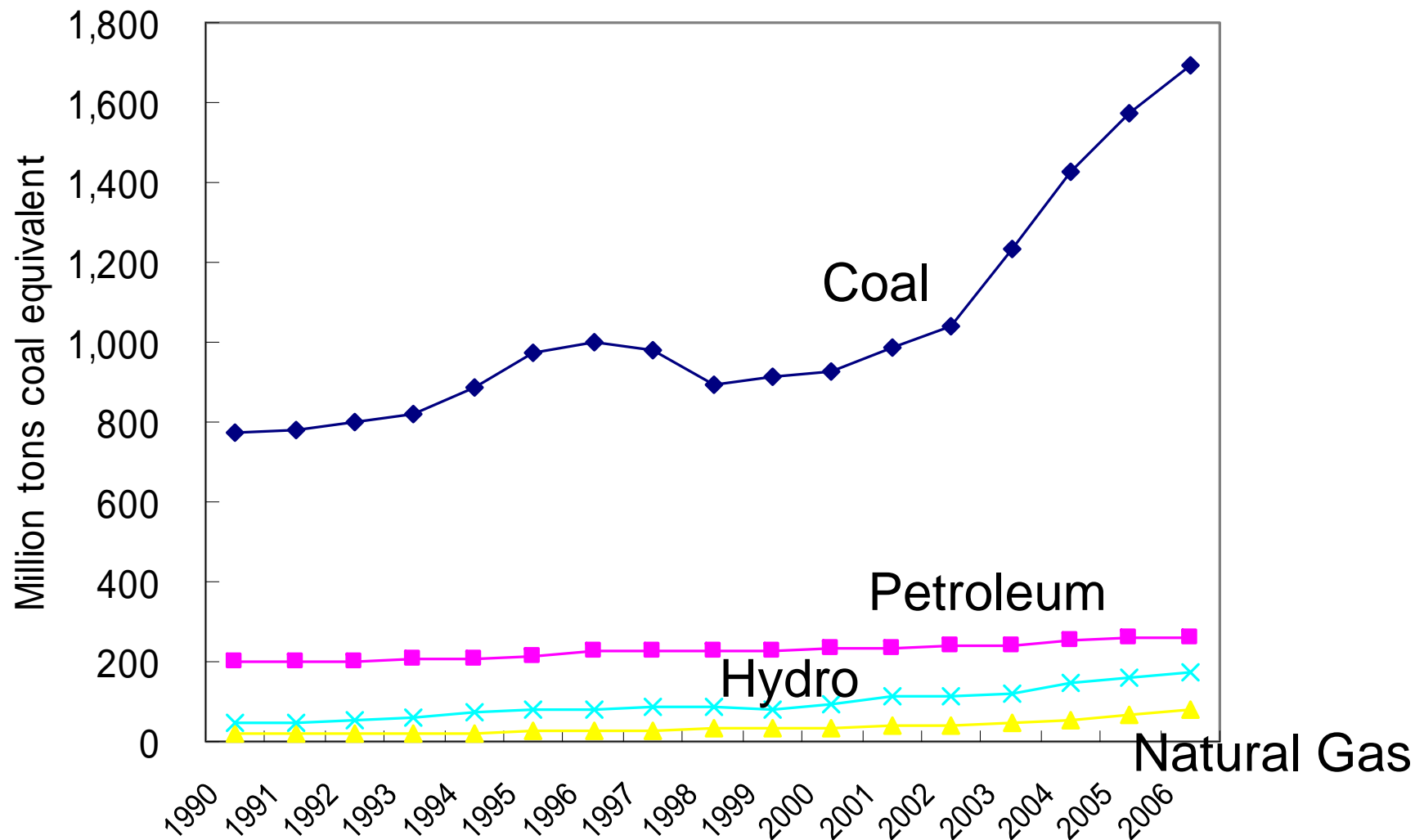
Source : EDMC (The Energy Data And Modelling Center, 2008)

CO2 Emission Per Capita (2005)



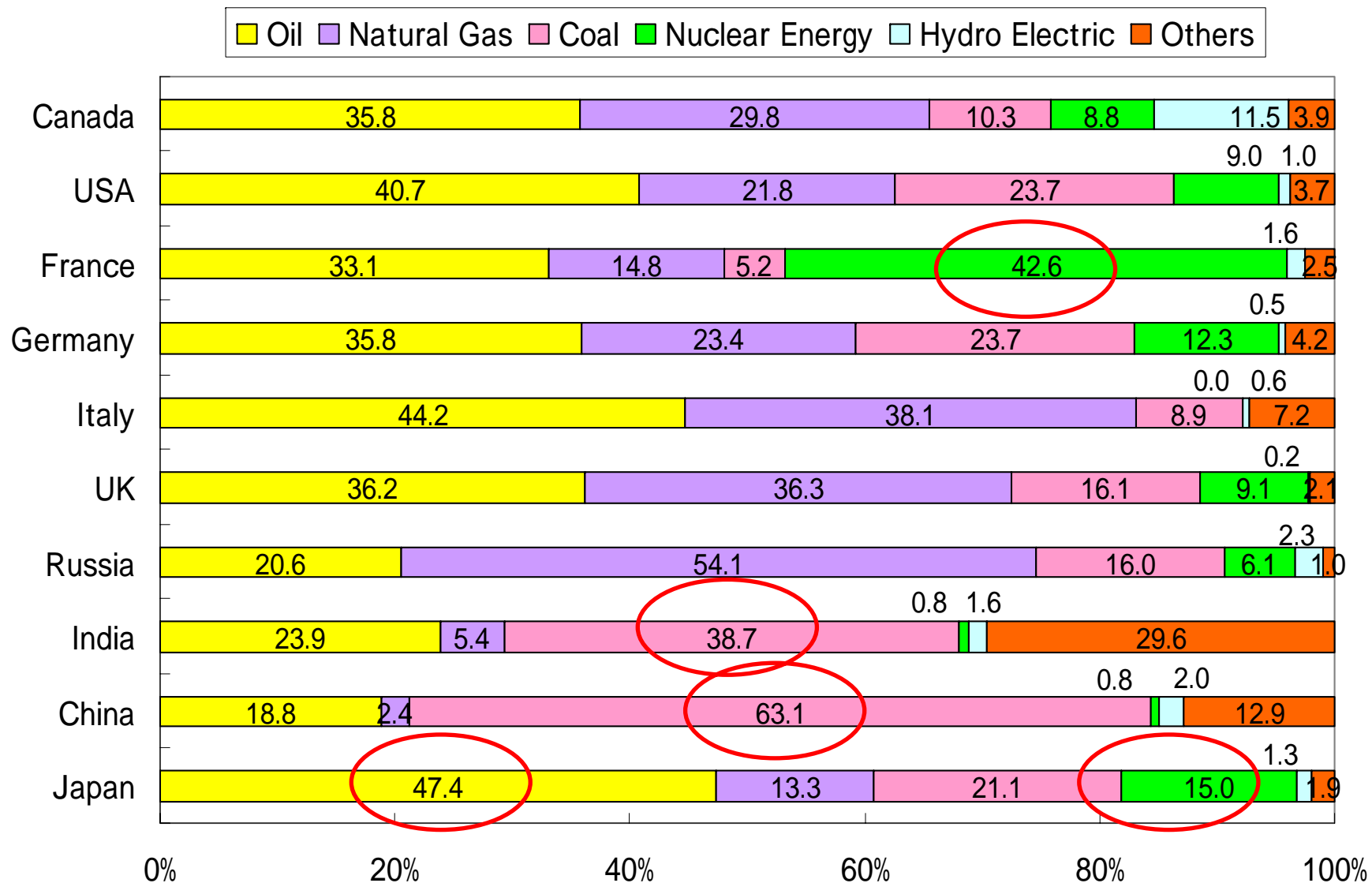
Source : Calculated by the author based on the data of EDMC

Primary Energy Supply in China



Source : Based on the data of China Yearbook 2008

Primary Energy Consumption (2005)

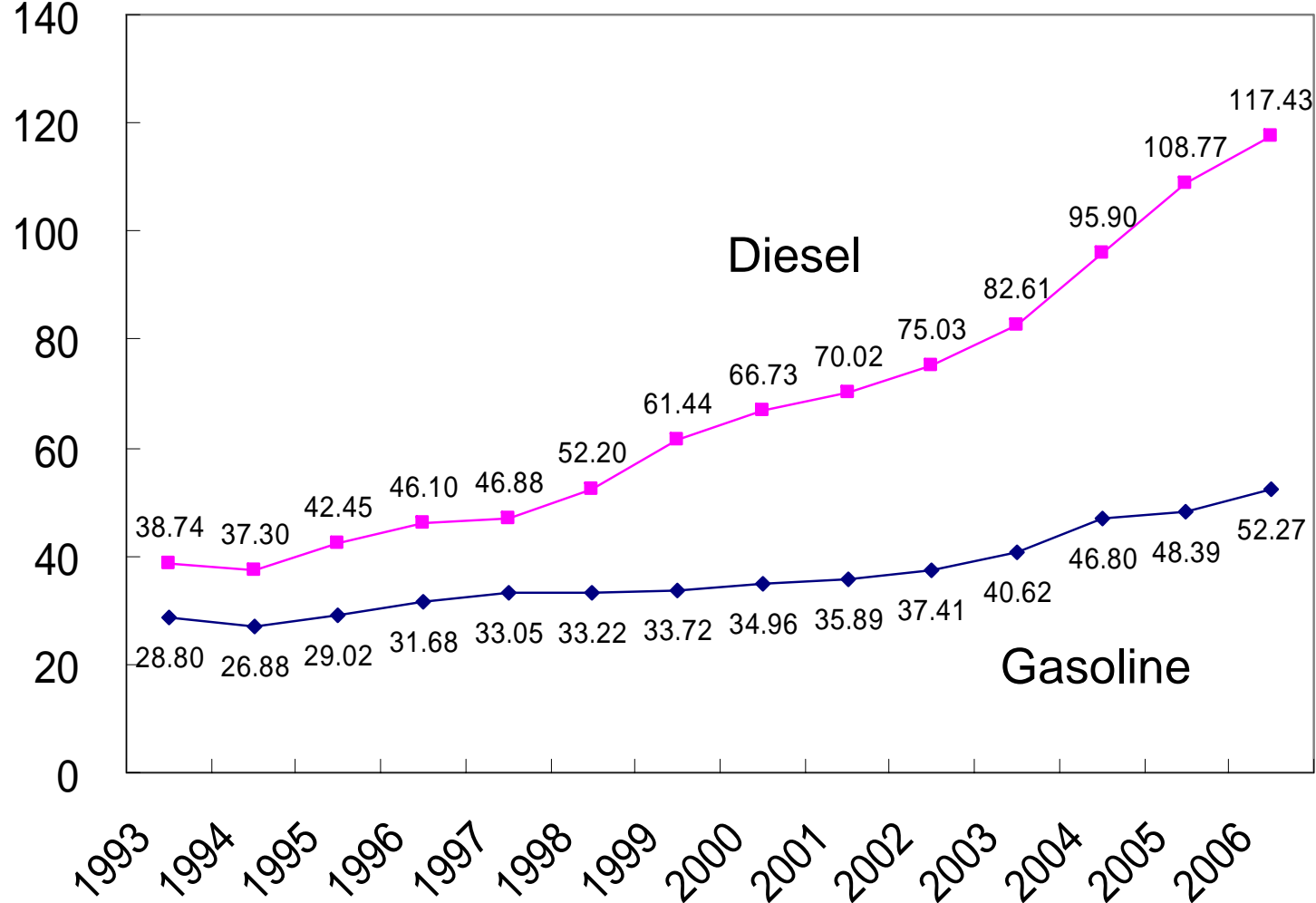


Source : OECD/IEA, Japan Electric Power Information Center, Inc.

Consumption of fossil fuels in China

(million tons)

Source : Based on the IEA data



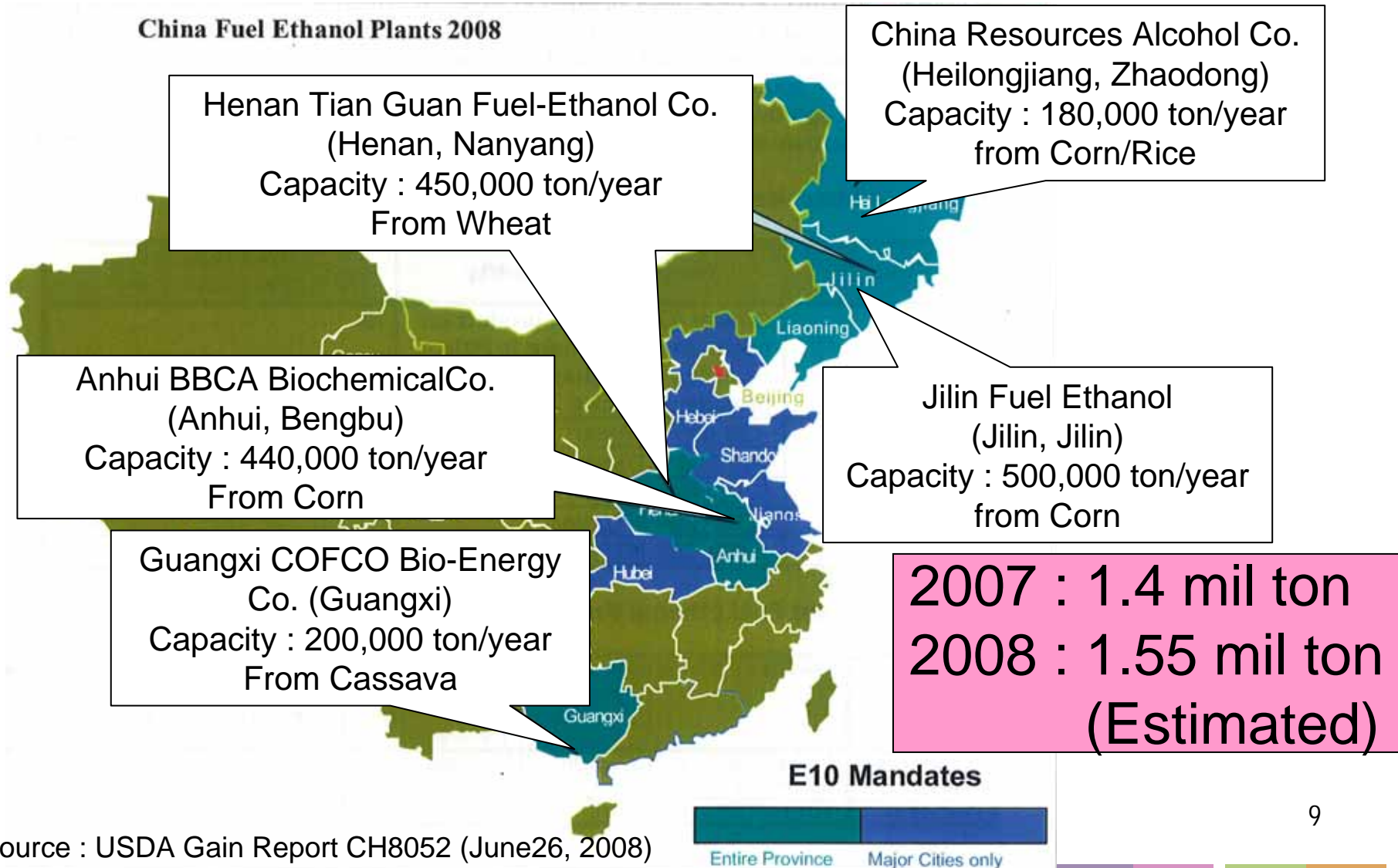
NDRC's Plan for China's Biofuel Development

Phase	Production Targets	Feedstocks	Aims
Phase (2006-2010)	Ethanol 2 million tons / year Biodiesel 0.2 million tons / year	Grains Cassava Sweet Potato Waste Oil	<ul style="list-style-type: none"> Commercialisation technology Develop non-food feedstocks and phase out grains Expand E10 programme in Guangxi Autonomous Region Expand biodiesel production capacity Set B10 standard
Phase (2011-2015)	No Targets	Cassava Sweet sorghum Jatropha Waste Oil	<ul style="list-style-type: none"> Expand E10 programme to southern China Use Jatropha for biodiesel Begin cellulosic ethanol production
Phase (2016-2020)	Ethanol 10 million tons / year Biodiesel 2 million tons / year	Cassava Sweet sorghum Jatropha Agricultural waste (Cellulosic)	<ul style="list-style-type: none"> Expand E10 programme nationally Maximise first-generation feedstock production Develop cellulosic ethanol capacity

Source : Bioenergy Business February 12, 2008

Bioethanol Production in China

China Fuel Ethanol Plants 2008



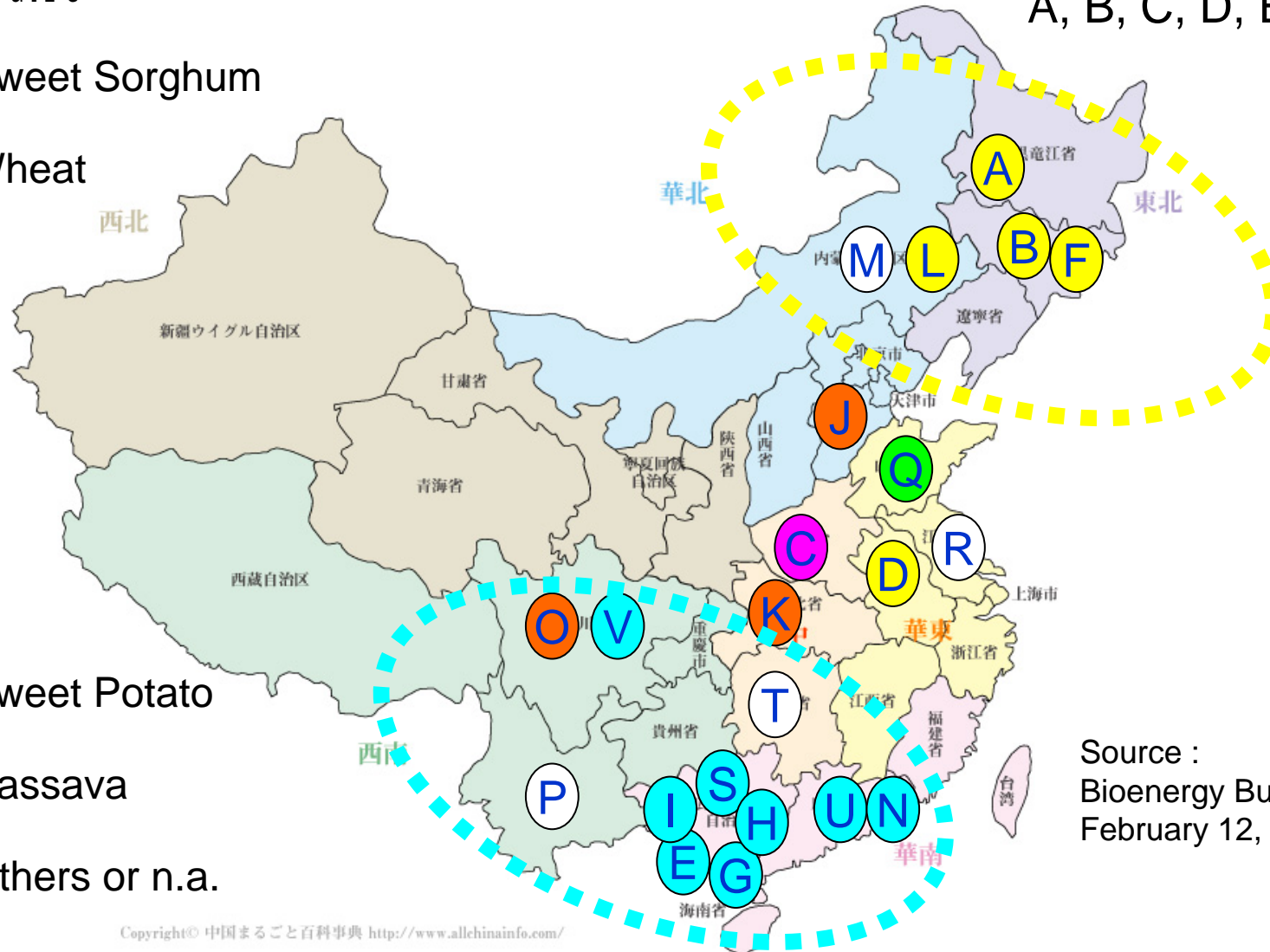
Source : USDA Gain Report CH8052 (June26, 2008)

Ethanol plants operating and planned (Map)

- Maize
- Sweet Sorghum
- Wheat

Operating:
A, B, C, D, E, F

- Sweet Potato
- Cassava
- Others or n.a.



Source :
Bioenergy Business
February 12, 2008

Ethanol plants operating and planned

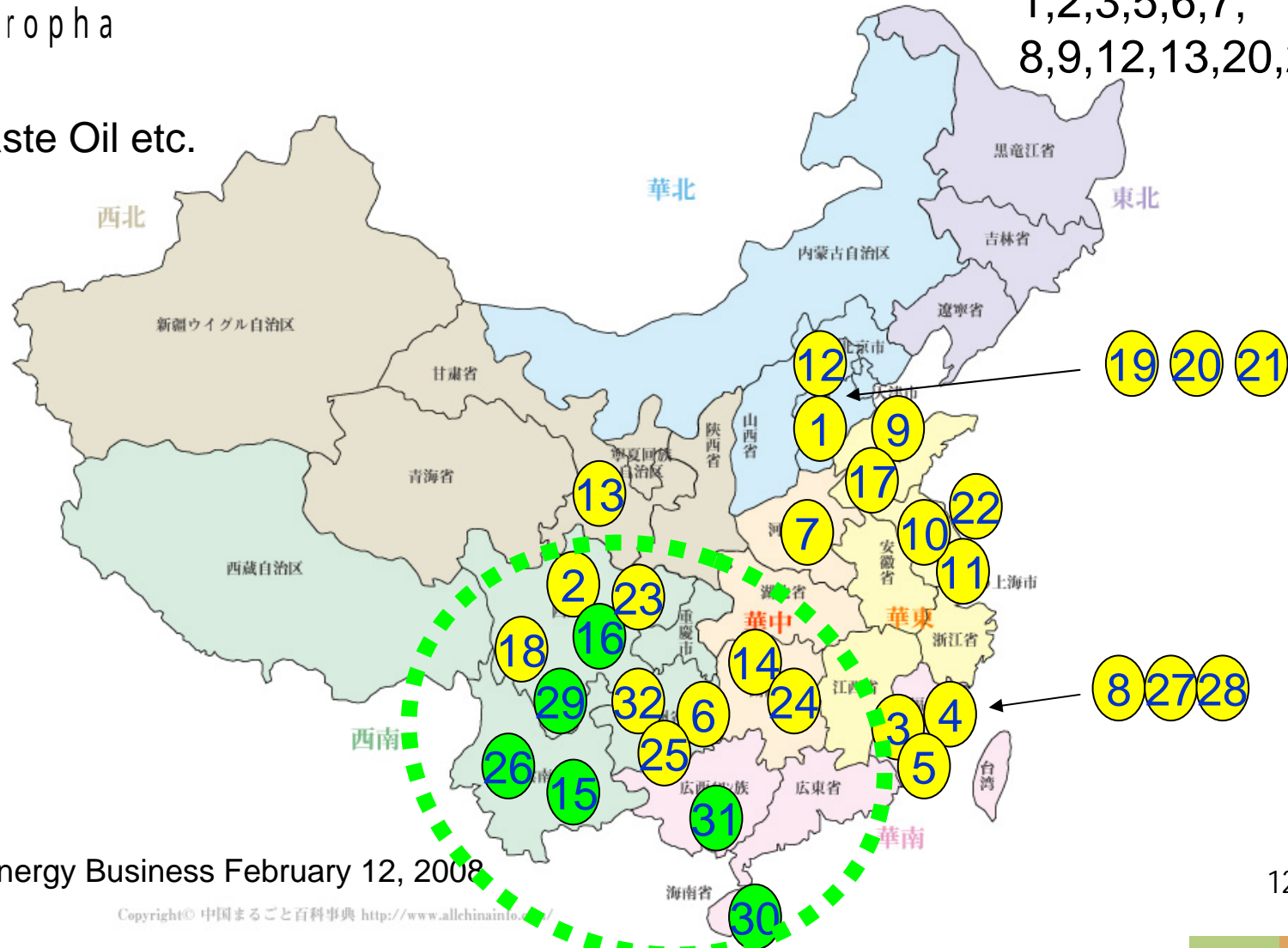
Key	Company	Location	Feedstock	Capacity (ton/year)	Status
A	China Resources Alcohol Co. (COFCO)	Heilongjiang	Maize	370,000	Opened 2001
B	Jilin Fuel Ehtanol Co., Ltd.	Jilin	Maize	600,000	Opened 2003
C	Henan Tianguan Fuelethanol Co., Ltd.	Henan	Wheat / Maize / Cassava	500,000	Opened 2001
D	Anhui BBCA Biochemical Co.	Anhui	Maize	440,000	Opened 2005
E	Guangxi COFCO Biomass Energy Co., Ltd.	Nanning (Guangxi)	Cassava	200,000	Opened 2007
F	Jilin Tuopai	Jilin	Maize	40,000	Opened 2005
G	Guangxi COFCO Biomass Energy Co. Ltd.	Guigang (Guangxi)	Cassava	200,000	Planned by 2010
H	CNPC (China National Petroleum Corporation)	Wuzhou (Guangxi)	Cassava	200,000	Feasibility Study
I	CNPC (China National Petroleum Corporation)	Laibin (Guangxi)	Cassava	200,000	Feasibility Study
J	COFCO	Hebei	Sweet potato / Maize	300,000	Planned
K	Henan Tian Guan	Hubei	Sweet potato	100,000	Planned by 2010
L	COFCO	Inner Mongolia	Maize / Sweet sorghum	300,000	Planned
M	Shuntong Biotechnology Co., Ltd.	Inner Mongolia	na	100,000	Planned
N	Qingyuan Longtang	Guangdong	Cassava / Sugar cane	100,000	Planned
O	Petrochina	Nanchong (Sichuan)	Sweet potato / Cassava	100,000	Planned by 2012
P	Petrochina	Yunnan	na	na	Planned
Q	CNPC (China National Petroleum Corporation)	Shandong	Sweet sorghum	200,000	Planned
R	CNPC (China National Petroleum Corporation)	Yancheng (Jiangsu)	na	200,000	Planned by 2010
S	Henan Tianguan Fuelethanol Co., Ltd.	Guangxi	Cassava	200,000	Planned by 2010
T	Henan Tianguan Fuelethanol Co., Ltd.	Hunan	na	200,000	Planned by 2010
U	Henan Tianguan Fuelethanol Co., Ltd.	Guangdong	Cassava	100,000	Planned by 2010
V	Henan Tianguan Fuelethanol Co., Ltd.	Sichuan	Cassava	200,000	Planned by 2010

Source : Bioenergy Business February 12, 2008

Biodiesel plants operating and planned (Map)

- Jatropha
- Waste Oil etc.

Operating:
1,2,3,5,6,7,
8,9,12,13,20,27



Source : Bioenergy Business February 12, 2008

Biodiesel plants operating and planned (1)

Key	Company	Location	Feedstock	Capacity (ton/year)	Status
1	Zhenghe Bioenergy	Handan (Hebei)	Waste Oil	10,000	Opened 2001
2	Gushan Environmental	Sichuan	Waste Oil	60,000	Opened 2002
3	China Biodiesel Holding	Longan (Fujian)	Waste Oil	50,000	Opened 2002
4	China Biodiesel Holding	Xiamen (Fujian)	Waste Oil	50,000	Planned Q2 2008
5	Yuanhua Energy Technique	Fuqing (Fujian)	na	30,000	Opened 2005
6	Jintongfu Biodiesel	Guizhou	na	10,000	Opened 2006
7	Henan Tianguan Group	Nanyang (Henan)	na	30,000	Opened 2009
8	Gushan Environmental	Fuzhou (Fujian)	Waste Oil	100,000	Opened 2003
9	Huawu Group	Dongying (Shandong)	Waste Cotton Seed Oil	100,000	Opened 2006
10	Nanjing Qingjiang Bioenergy Tech	Nanjing (Jiangsu)	Vegetable Oil	750,000	Planned
11	Nantong Biolux	Nantong (Jiangsu)	Rapeseed Oil (70% imported)	250,000	Opening delayed 2006 to 2009
12	Guofeng Group, Zhonglian	Nanhe (Hebei)	Waste Oil	200,000	Opened 2006
13	Gansu Huacheng Biofuel	Lanzhou (Gansu)	Waste Oil	400,000	Opened 2006
14	Zhonghe Energy	Ningxiang (Hunan)	na	500,000	Planned 2008
15	Sunshine Tech Group (UK)	Yunnan	Jatoropha	500,000	Planned 2010
16	Petrochina	Nanchong (Sichuan)	Jatoropha	500,000	Planned

Source : Bioenergy Business February 12, 2008

Biodiesel plants operating and planned (2)

Key	Company	Location	Feedstock	Capacity (ton/year)	Status
17	CNPC (China National Petroleum Corporation)	Shandong	na	100,000	Planned
18	Sinopec	Panzhuhua (Sichuan)	Woody Biomass	80,000	Planned
19	Sinopec	Hebei	Waste Oil	2,000	Planned
20	Gushan Environmental	Hebei	Waste Oil	30,000	Opened 2004
21	Gushan Environmental	Beijing	Waste Oil	100,000	Planned Q1 2008
22	Gushan Environmental	Shanghai	Waste Oil	50,000	Planned 2008
23	Gushan Environmental	Chongqing (Sichuan)	Waste Oil	30,000	Planned 2009
24	Gushan Environmental	Hunan	Waste Oil	30,000	Planned Q4 2008
25	Zhongshui Energy	Guizhou	na	20,000	Planned
26	Yunnan Shenyu New Energy	Yunnan	Jatropha	100,000	Planned 2008
27	China Clean Energy	Fuzhou (Fujian)	Waste Oil	10,000	Opened 2005
28	China Clean Energy	Fuzhou (Fujian)	Waste Oil	100,000	Planned Q4 2008
29	CNOOC (China National Offshore Oil Corporation)	Panzhuhua (Sichuan)	Jatoropha	100,000	Planned 2010
30	CNOOC (China National Offshore Oil Corporation)	Dongfang (Hainan)	Palm / Jatropha	43,000	Planned 2007
31	D1 - BP Fuel Crops	Baise (Guangxi)	Jatropha	10,000	Planned 2009
32	Zhongshui Energy	Guizhou	Waste Oil / Tung Tree Oil	20,000	Planned 2007

Source : Bioenergy Business February 12, 2008

Biomass Feedstock Composition

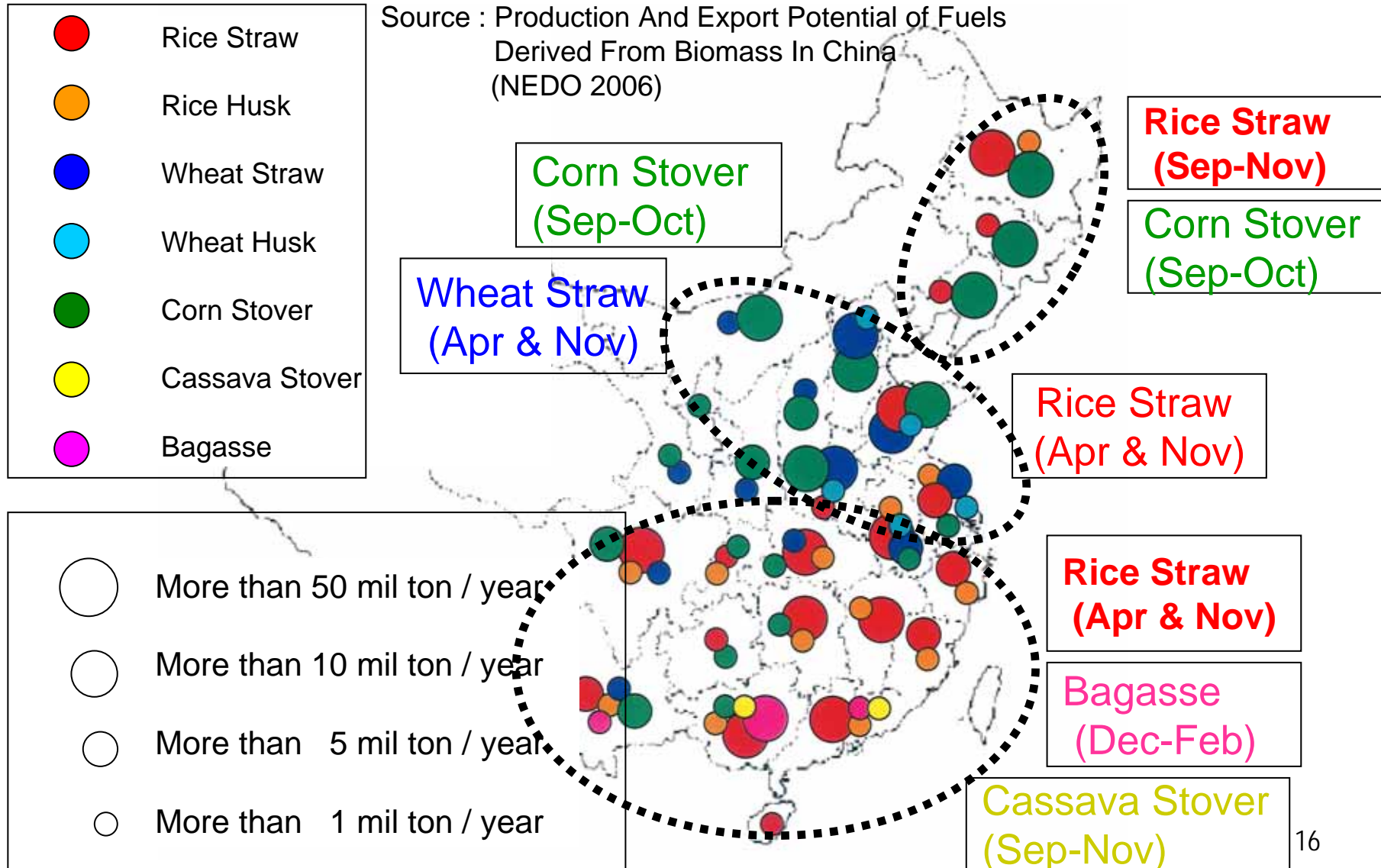
(% mass)

	Soft Biomass				Hard Biomass			
	Corn Stover	Wheat Straw (Triticum aestivum)	Forage Sorghum	Sugarcane Bagasse	Black Locust	Eucalyptus	Hybrid Poplar	Monterey Pine (Pinus Radiata)
C6 Total	36.8	33.7	34.7	39.8	42.7	50.5	46.0	54.8
Glucan	35.5	32.6	34.0	39.0	40.2	48.5	42.8	41.7
Mannan	0.5	0.3	0.2	0.3	1.6	1.0	2.5	10.7
Galactan	0.9	0.8	0.5	0.5	0.9	0.9	0.8	2.4
C5 Total	21.5	21.6	15.8	21.9	16.2	11.9	16.7	7.4
Xylan	19.2	19.2	14.1	20.3	15.1	11.6	16.0	5.9
Arabinan	2.3	2.4	1.7	1.6	1.1	0.4	0.7	1.5
Lignin	18.7	16.9	16.1	24.1	25.0	27.7	24.4	25.9
Ash	11.6	10.2	5.0	5.0	2.6	0.9	1.1	0.3
Uronic acids	3.2	2.2	1.1	1.4	4.0	4.2	4.0	2.5

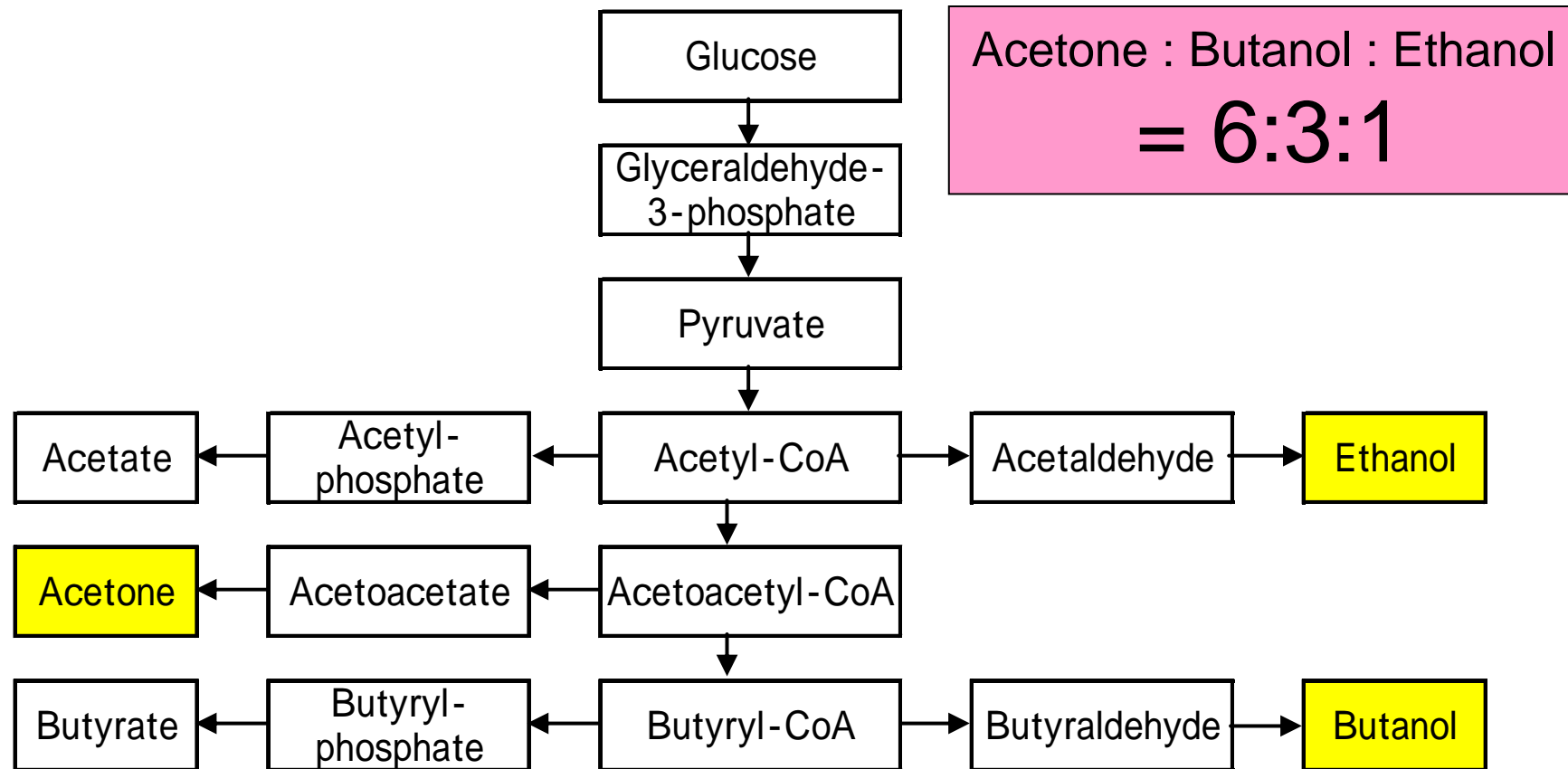
Source : Biomass Feedstock Composition and Property Database, U.S. Department of Energy

Agricultural Waste in China (2004)

Source : Production And Export Potential of Fuels
Derived From Biomass In China
(NEDO 2006)



Biobutanol (ABE Fermentation)



Properties of Biobutanol (n-Butanol)

	Ethanol	n-Butanol	Gasoline
Sp. Gravity, 60/60/F	0.794	0.814	0.720-0.775
Heating Value (MJ/L)	21.1-21.7	26.9-27.0	32.2-32.9
RON	106-130	94	95
MON	89-103	80-81	85
Rvp@ 5% / 10% (psi)	31/20	6.4/6.4	< 7.8/15
Oxygen (%wt)	34.7	21.6	< 2.7

Source : 1-Butanol as Gasoline Blending Bio-component (BP)

Merit :

Heating Value is higher.
RVP (Reid Vapour Pressure) is lower.
(Lower risk of photochemical smog)
Better tolerates water contamination
and less corrosive.

Demerit :

The octane rating is similar
to that of gasoline, but lower
than that of ethanol

Biobutanol production started in China



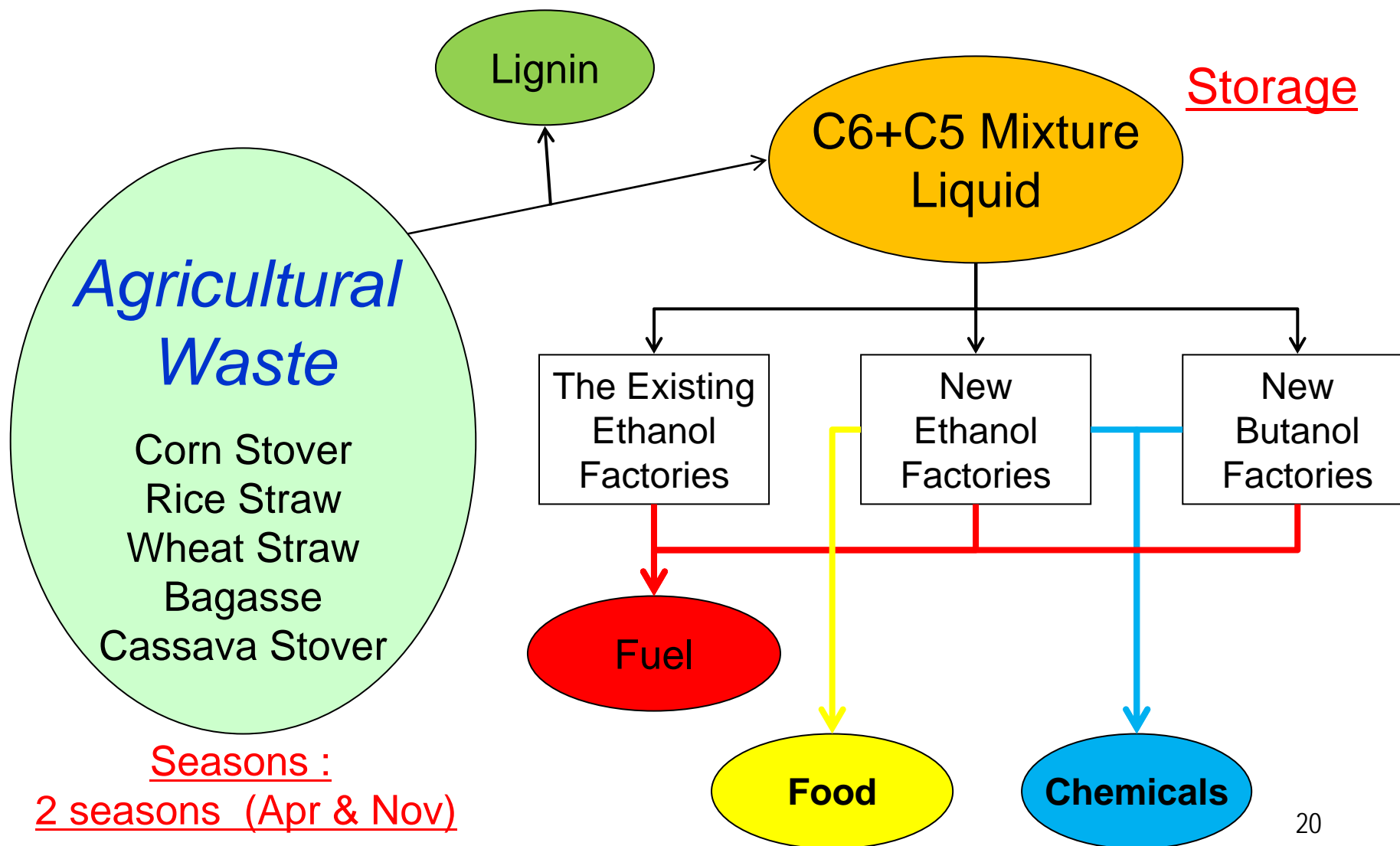
(Jiangsu Province)

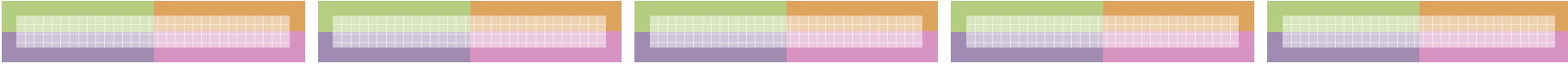
**November 2008,
Production of
n-butanol and Acetone
from Cassava started.**

**1st Phase :
n-Butanol 50,000 tons**

**3rd Phase :
n-Butanol 200,000 tons**

Biomass Utilization Model in China





Thank you for your attention.
謝謝！