Biodiesel, environmentally friendly alternative energy

Orientation of Biodiesel development through overseas plantation

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Biodiesel material oil

▣ Increased consumption of alternative energy

❖ **Due to changes in the world's energy environment such as unstable circumstance in the middle east, increased demand of BRICs countries, and enhanced market domination by OPEC,**

→ Continuation of high oil price situation

❖ **Many countries are increasingly developing and consuming more alternative energy**

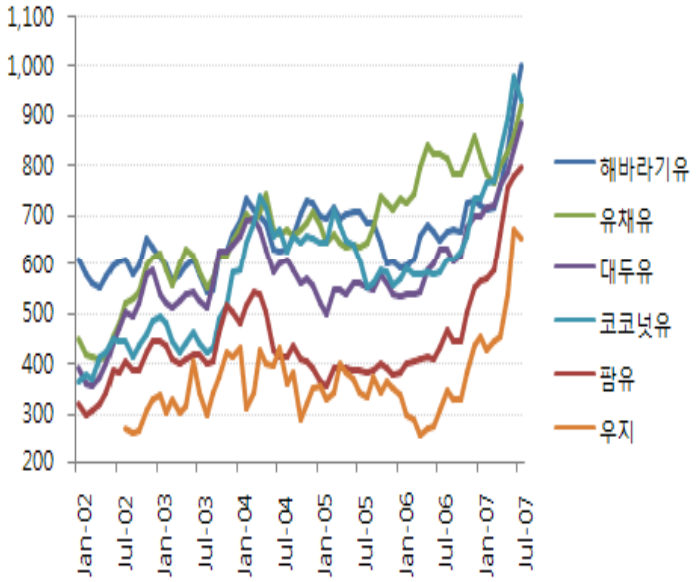
❖ **Nations are enhancing energy security as the new nationalism emerges**

Steep increase in material oil price due to increased consumption of alternative energy

▣ Steep increase of vegetable oil price for Biodiesel

Steep price increase due to unbalanced oilseed crop demand and supply caused by bio energy development heat in many countries

Oil price in Jan. 2000 ~ Jul. 2007



year	Beef tallow	Palm oil	Coconut oil	Soybean oil	Rapeseed oil	Sunflower oil
2002	285	365	421	454	485	594
2003	347	433	467	554	600	593
2004	368	455	661	616	686	684
2005	355	382	617	545	669	677
2006	320	437	607	599	794	658
2007	519	673	842	771	824	806

(DATA : PDS)

(Annual average price, $/ton)

▪해바라기유: Sunflower oil, 유자유: Rapeseed oil 대두유: Soybean oil, 코코넛유: Coconut oil, 팜유: Palm oil, 우지: Beef tallow

▣ Current position of Biodiesel material oil in Korea

Biodiesel material in Korea consists of approximately 77% of imported soybean oil and 23% of domestically collected waste cooking oil

To supply BD1 (apprx. 200 thousand tons) with 1% Biodiesel content requires 130,000ha area

→ Light oil in 1,500ha Model rapeseed business

→ 47,800ha of fallow land and 31,600ha for barley cultivation in southern Daejun area

Waste cooking oil is estimated to be 200 thousand tons a year of which approximately 30,000 tons can be collected for the use as Biodiesel

Due to narrow land, domestic production hardly secures sufficient BD material oil

Biodiesel Supply in Korea

▣ Biodiesel status in Korea

❖ **BD20 model distribution for 4 years from May '02 to June '06**

❖ **After completion of model business , commercialization of BD5 which is widely distributed in international market instead of BD20 from July '06**

❖ **Among 18 registered BD suppliers, only 7 companies including BND Energy are supplying Biodiesel to oil refinery companies as of '07**

- Annual capacity of 18 companies which are registered in Ministry of Commerce, Industry and Energy : 756,000KL

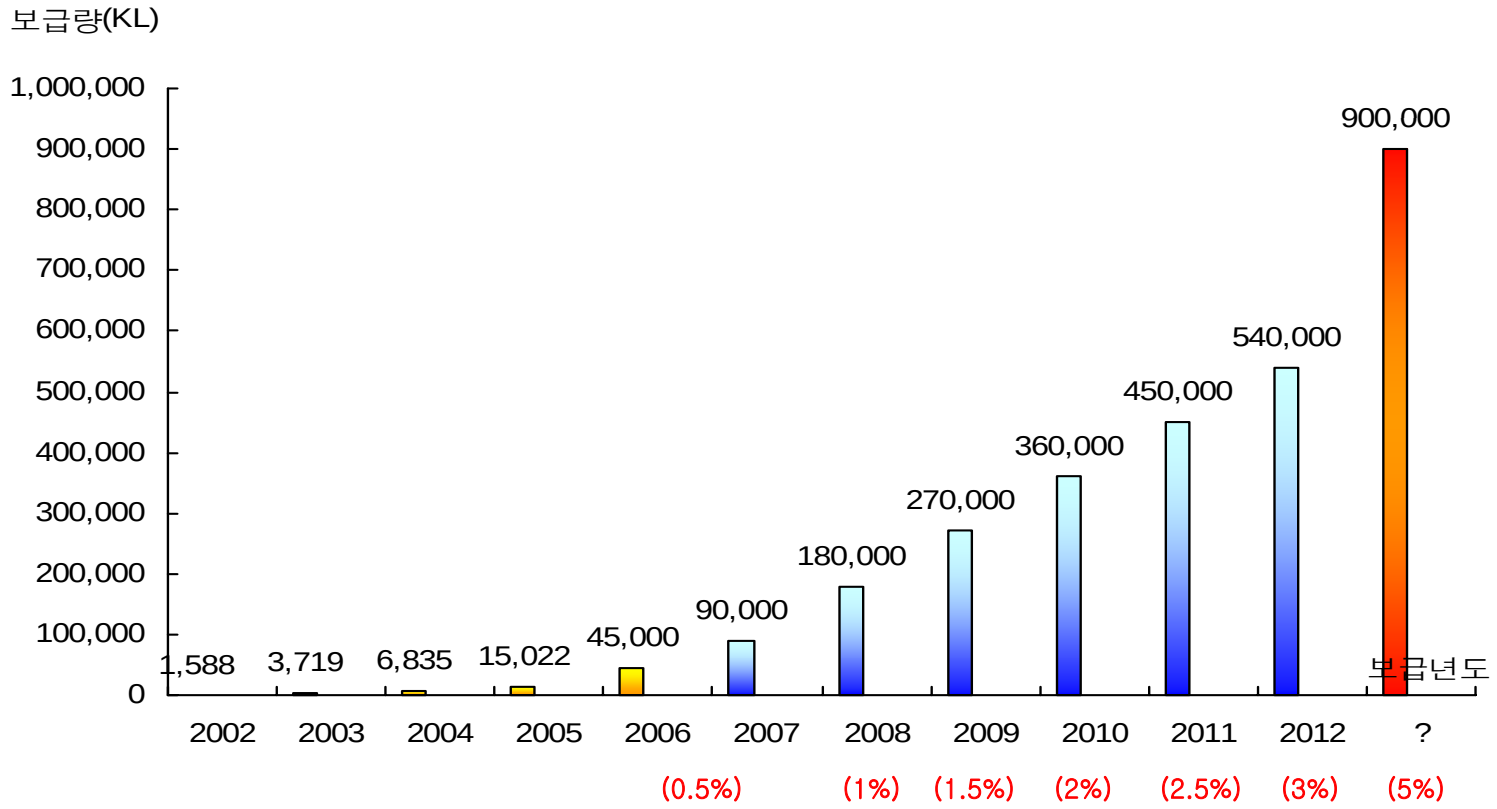
❖ **Economic Coordination Meeting announced mid/long term Biodiesel distribution plan in September '07**

- To increase the mixture rate of Biodiesel crude liquid which is currently 0.5% by 0.5% each year to expand to 3% in 2012 and 5% in the long term

- To promote reasonable systematic improvement including mitigating conditions of BD20 maintenance facility ownership, allowing commission contract, and distribution of government vehicles to air quality control areas through exclusive gas stations (owned by local governments) (Ministry of Commerce, Industry and Energy, Ministry of Environment)

- To extend traffic tax exemption until'08~'10 (Ministry of Finance and Economy)

▣ Biodiesel supply and plan in Korea



'07.8 Commission of National Energy'

07.9 Ministry of Commerce, Industry and Energy

▪보급량 (KL): Supply (KL), 보급년도: Year

Necessity and development and Development orientation of Overseas plantation

▣ Energy crisis and Biodiesel distribution policy in Korea

Nations are enhancing energy security and environment regulations as the new nationalism emerges

Korea → Energy consumption is increasing 10% each year and over 96% are dependent on import

→ Possibly will be put under obligation of exhaust reduction from 2013 as the No. 9 CO2 exhaust country in world

To reduce oil dependency and cope with environment regulations, government encourages distribution of alternative energies including Biodiesel

- **Enhancement of Biodiesel target mixture rate and improvement of system**
- **Tax exemption support for Biodiesel**
- **Establishment of mid/long term plan for fuel oil alternatives in transportation area**
- **Securement of Biodiesel material and stabilization of supply by conducting Model rapeseed business**

▣ Necessity of overseas plantation of Bio energy raw material crop

Advanced countries such as USA and EU

secure price competitiveness by using surplus agricultural products of homeland
→ promote Bio energy distribution

Due to narrow land area and weather conditions, surplus agricultural products that can be used as Biodiesel material hardly exist

→ Depends approximately 80% of Biodiesel material in import

→ Defenseless in case of sudden increase of raw material price due to steep increase in international grain price

→ To supply 1% BD with rapeseed oil requires 130,000ha area

Weak price competitiveness due to high raw material price

→ Among Biodiesel cost items, raw material oil price takes account over 90% of manufacturing cost

Stabilization of supply by securing price competitive materials through overseas plantation

▣ Necessity of non-edible material crop development

Raw material crops for Bio energy were mainly edible crops such as soybean oil, rapeseed oil, and palm oil.

→ Affects the international grain price
→ Noted that it may agitate foot shortage problems in underdeveloped countries in Africa

Active support is required particularly for non-edible oil crops that are less affected by the international grain price

▣ Non-edible oil crop for Biodiesel – Jatropha

Originated from South America and Africa

Non-edible due to toxicity

Cultivated within fence to protect the farm land from domestic animals in most tropical and subtropical zones

Has no specific requirement in terms of weather or soil, and can be used in afforesting fallow land

Used as medical plant, dye material, organic fertilizer, fence, and new energy crop

Current fruit yield, oil content, quality and price make Jatropha the most ideal material crop for Biodiesel

→ Less affected by international grain price

→ Extracts 31~40% oil from fruit

→ Jatropha can be harvested for more than 40 years (25 years in case of Palm)

→ Satisfies Korean quality standard (Low temperature property: Jatropha BD approx. 3℃, Palm oil BD over approx. 15℃)

▣ Oil alternative effect of overseas Jatropha plantation

❖ 100,000ha Jatropha plantation

	1 year/t	10 years/t	40 years/t
Seed	1,000,000	10,000,000	40,000,000
Oil	350,000 (2,506,000bbl)	3,500,000 (25,060,000bbl)	14,000,000 (100,240,000bbl)

※ bbl=7.257*LT(long ton), LT=1.01605ton

❖ Oil alternative effect of 100,000ha Jatropha plantation

	1 year	10 years	40 years
Oil alternative effect	USD 175,420,000 (1,650 billion won)	USD 1,754,200,000 (16,500 billion won)	USD 7,016,800,000 (66,000 billion won)

※ Dubai oil bbl: 70$, Exchange rate : 940 won

▣ Overseas plantation of Non-edible oil crops

- **BND Energy**

: Jatropha plantation : Entered into MOU-MOA with Korao group, LOAS

- 200,000ha (Approximately 650 million pyeong) in 4 areas including Vientiane and Savannakhet
- Production estimate: 2008 – 200 thousand tons, 2009 – 400 thousand tons, 2010년 – 500 thousand tons
- Currently promoting oil crop plantations in Myanmar, Indonesia, and Malaysia

- **Eco solution**

: 100,000 ha (Approximately 3 billion pyeong) Jatropha plantation by establishing joint corporation with PNOC-AFC, Philippines

- **Biomass Korea**

: Plans to produce 100 thousand tons of Jatropha oil in 2009 and 300 thousand tons in 2012 by establishing 150,000 ha (4 billion and 5 thousand pyeong) Jatropha plant in Indonesia

▣ Orientation of overseas plantation development of non-edible oil crop

- **Political support for development of overseas non-edible crop plantation**
  - Establishment of development orientation for long-term securement of raw material crop rather than short term policy

- **R&D support for Biodiesel raw material energy crop**
  - Breeding of raw material crops and enhancement of productivity by using biotechnology

- **Establishment of Overseas plantation of non-edible oil crop promotion act**
  - Application of same tax system to the oil crops produced in overseas by domestic company for the use in Bio fuel as the domestic production

- **Provision of incentives including customs refund when the raw material crops cultivated in overseas by domestic companies for the use as fuel alternative in Korea**

▣ Orientation of overseas plantation development of non-edible oil crop

Financial support such as "Success Repayable Loan System" which is supported to oil field development businesses

- Bio diesel raw material development through overseas plantation offers same effects as "oil field development business" such as counterplan to oil crisis and diversification of energy sources

- Due to massive cost in initial plant development stage, overseas plantation requires financial support

- Unlike oil field development, chance of failure is low and the profit can be generated for over 40 years after plant development

- 100,000ha overseas plantation has the effect of replacing annual 350,000t oil - approximately 1,650 billion won

In case of oil field development

Despite total investment of 1,275,260 thousand dollars from '84 to present through "Success Repayable Loan System", the return is less than 1/10 → Low success rate

Success Repayable Loan System: A system that exempts the principal loaned from the Petroleum Enterprise Fund in part or in whole in case the oil land development project is failed, and collects a certain rate of special charge in addition to the principal in case the project was a success

Overseas Resources Development Business Act : "To contribute to the national economic development and promotion of international economic cooperation by promoting overseas resources development and securing long term and stable resources"

▣ Expected effects of overseas plantation for non-edible oil crops

- **Securement of Biodiesel price competitiveness vs. light oil**

  - Securement of low price raw material through direct overseas plantation
  - Preparation for sudden increase of grain price
  - Overseas export of Biodiesel is possible

- **Oil import replacement – Energy security and preparation for high oil price**

  - 100,000ha overseas plantation replaces annual 350,000t of oil (Approximately 1,650 billion won)

- **Promotion of consistent government policy through securement of stable raw material**

  - Replace 3% of light oil by 2012, and 5% in long term

- **Support for the economic development of underdeveloped countries in Southeast Asia**

  - Enhancement of external image of Korea

- **Settlement of reverse function of expanded biodiesel distribution through cultivation of non-edible crops**

  - Solves expansion of starvation due to usage of edible material
  - Prevents market distortion such as price increase of domestic animal food due to usage of edible material

Thank you