BIOFUELS: THE GREEN DREAM[1]

Professor Manuel Ribera was asked by the Instituto Internacional San Telmo to prepare a document on the Biofuels sector, to serve as a basis for debate in a meeting to be held with entrepreneurs and CEOs from various sectors which have been affected by the arrival of the **new green energy.**

This is a complex subject as it has had a multisectorial impact: agriculture, animal husbandry, animal feed, agrifood industries, oil operators, the automobile industry and the emerging biofuel sector. In addition, the subject requires analysis from different points of view, investigating the impact on dependence and energy supply, the environment and biodiversity, development and rural welfare, food prices, inflation and farmers' incomes, etc. Not to forget areas of considerable significance such as the new technologies and the conditions of profitability and competitiveness of the biofuel industry in Spain and Europe. In short, it aims to analyse and, if possible, order ideas on the present and future of the sector and on the doubts, opportunities and threats of the new green energy, from environmental, social, microeconomic and macroeconomic perspectives.

The use of biofuels such as alcohol and oil is by no means new, but automobile manufacturers soon discovered that oil (black gold) produced more energy per litre and was far cheaper. It was necessary to wait until the oil crisis in 1973 before the United States and other countries began to mix ethanol produced from maize (white gold) with petrol. Furthermore, Brazil, as a consequence of the energy shortage resulting from the oil crisis, started production of bioethanol from sugar cane more than 30 years ago, obtaining more than 40% of the energy consumed by transport from bioethanol. Combined with the discovery in 2007 of new oil wells, this has enabled Brazil to become self-sufficient in terms of energy.

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[1] Case by the Research Division of San Telmo International Institute, Spain. Prepared by Professor Fernando Faces Garcia and Research Assistant Gloria Ocaña Derqui, for use as a basis for debate and not as an example of the management, appropriate or inappropriate, of a particular situation.

However, it was not until after 2000, as a consequence of the progressive rise in oil costs, the excessive dependence on energy of the member countries of the OPEC and the geopolitical uncertainty of the Middle East, combined with environmental awareness derived from the Kyoto Protocol, that the more developed countries, led by the United States and Europe, turned decidedly towards the search for a cleaner and independent energy alternative: biofuels, **energy grown in fields[2].**

The subject matter was enthralling. After analysing the available documentation and interviewing the major figures in the sectors concerned (public administration, university specialists, business associations and producer businesses), Professor Manual Ribera was ready to bring together the information and ideas collected, with the aim of being able to contribute to a fruitful debate.

BIOFUELS: THE CULTIVATED ENERGY

Biofuels are a subgroup of combustion biofuels, energy obtained from biomass. The best known biofuels are bioethanol and biodiesel, liquid fuels used as fuel in the automobile industry, mixed with petrol or diesel.

Bioethanol is ethylic alcohol produced from the fermentation of sugars found in plant matter including cereals, sugar cane and biomass. It is used by mixing it with petrol in varying percentages[3].

Biodiesel is a renewable liquid fuel, consisting of fatty acid methyl and ethyl esters, obtained from vegetable oils extracted from oily plants (rapeseed, sunflower, palm, soya oils...) and/or waste oils and animal fats. It is used blended with diesel in varying proportions in diesel engines[4].

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[2] Further information in the document *Biocombustibles, los condicionantes de un sector naciente'*.
Horacio Gonzalez-Aleman. March 2008. San Telmo International Institute.

[3] Bioethanol is a renewable fuel used in the automobile industry in the form of a direct blend or following chemical transformation.
-Production of ETBE (45% Bioethanol + 55% isobutylene)
-Direct blend with petrol
5% volume, E5 (limited by definition of petrol in EU)
10% volume, E10 (USA)
Higher blends, E85 (FFV in Sweden and Spain), E95 (buses in Stockholm), E100 (special engines in Brazil)
_Blend with diesel, at demonstration stage 'E-diesel'.

[4] Biodiesel is blended directly with diesel for use in diesel engines in varying proportions:
5% volume BD5 (limited by definition of diesel in the EU).
10% volume, BD10 (Germany, France, Austria).
20% volume, BD20 (Germany, France, Austria).
30% volume, BD30 (Germany, France, Austria).
100% volume, BD100.

KEY FACTORS TO THE DEVELOPMENT OF THE BIOMASS FUEL INDUSTRY

After 2000, there was a major take-off of the biomass fuel industry throughout the world, driven by the governments of the more developed countries. Key factors in its development were based on a triple objective: protecting the environment and saving energy, reducing dependence on oil and offering a hopeful economic alternative to the moribund rural economy.

Environmental balance of biofuels

In environmental terms they help to meet the terms of the Kyoto protocol, as both bioethanol and biodiesel are renewable fuels which give off lower levels of greenhouse gases than fossil fuels. This was demonstrated in the studies commissioned to CIEMAT[5] by the Spanish Ministry for the Environment in 2005 and 2006, based on the true position of the Spanish biofuel plants and using Life Cycle Analysis[6]. According to this report for blends of 85% bioethanol (E85), CO_2 emissions were reduced by 90% and for blends of 5% (E5) they were reduced by 4%, in comparison with 95 octane petrol. With respect to biodiesel, for concentrations of 100% (BD100A1), CO_2 reductions of 91% were obtained and for blends of 5% (BD5A1) reductions of 4% were obtained compared to diesel EN-590.

Energy balance of biofuels

In addition, the energy balance was favourable. Numerous studies in recent years, including the CIEMAT study, concluded that the ratio between the energy of biofuels and fossil energy used in its production was above 1.

According to this report, for blends of 85% of bioethanol (E85) primary energy savings of 17% were obtained and for blends of 5% (E5), savings of 0.28% compared to 95 octane petrol. For biodiesel, the energy balance is still more favourable: for 100% concentrations of vegetable oils (BD100A1), energy savings of 45% were obtained compared with diesel EN-590 and 5% concentrations (BD5A1) led to 2% energy savings.
Other studies concluded that the energy balance of ethanol obtained from sugar cane was even more surprising. Eight units of energy produced were obtained for each unit of fossil energy used with a 50% reduction in greenhouse gases.[7]

Reduction of external energy dependence

The third factor in the global take-off of the biofuel industry was that it reduced the external energy dependence on oil producing countries (OPEC), at a moment of spectacular increases in oil prices, which in the second week of March 2008 exceeded 108

[5] CIEMAT: Analysis del ciclo de vida de combustibles alternativos al transporte. Ministerio Medio Ambiente 2005 and 2006. The results can be found in:
http;//www.energiasrenovables.ciemat.es/?pid=3000&id_seccion=12&dir=documentos.
[6] Some experts and associations questioned the reliability of these results (including the Association of Oil Producers due to the singularities of the initial hypothesis.
[7] Source: DOE, EPA; World Watch Institute University of the State of IOWA.