Agrofuels

Our Cars Versus Our Food Needs

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Realization: September 2008

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Introduction

The debate on agrofuels is very real these days. Some present it as the solution to the problem of the lack of fossil fuels. Others denounce agrofuels because they will be in direct competition with the food products necessary both to human beings and cattle-breeding. FIMARC's position is the same as that of the former Rapporteur on the Right to Food, M. Jean Ziegler, who says he is very worried about this competition…

« The Special Rapporteur is very worried about the fact that biofuels will provoke hunger. [This production] could very well lead to a competition between food and fuels which will leave the poor and hunger-stricken in the developing countries at the mercy of increasingly high prices of food, land and water. The use of methods from the agro-industrial sector for transforming food into fuels will lead to unemployment and to the violation of the right to food » [1]

We wanted to present you with a document that will allow you to better understand the situation and forge your own opinion taking your country's or continent's specific situation into account.

The document will be divided in three main sections. The first part will be centered on the facts, numbers and impacts of agrofuel consumption. The second part will deal with the negative consequences of agrofuels on human rights and the third part will focus on possible ideas for actions. You will also find two annexes to the document which are also important since they explain the terms and technical procedures related to agrofuel production.

This document, aside from its information purposes, is also set out to be a pedagogical document at your disposal. At the end of the chapters, you will find a grid of questions that allow you to reflect on your country's or region's situation. This document is *your* document and should be a tool that allows you to search, understand and analyze the situation specific to your region.

There is a lot of information on the agrofuels question. You can find it easily on the internet and in various publications. But what are talking about? This document should allow you to search the most objective information and thus understand the situation in your area and maybe to take up actions which will allow counteracting the current trend if necessary.

We would like to warmly thank the FIMARC Working Group on Human Rights which, mandated by the Executive Committee, produced this document. This was an interesting and enriching work, but it meant reading dozens of documents, analyzing them and synthesizing piles of information. We extend our thanks to this Working Group for all this work, which we hope will meet your expectations in this wish to be better informed and able to better analyze the agrofuel situation.

We wish you a fruitful work and do not hesitate to ask for our help for any further information and to let us know more about your analysis and discoveries, seeing that this debate is definitely an ongoing one and that it will even certainly be amplified, as is already the case with the debate starting on the second generation of agrofuels.

Kind regards,

Daisy Herman
Secretary General

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[1] *Jean Ziegler, Special Rapporteur on the Right to Food at the United Nations Human Rights Council – 2008 Report on the Right to Food – N°53*

Definitions

We talk about agrofuels to refer to the fuels made from agricultural produce. They are liquid, solid or gas fuels which can replace, in engines, oil-derived fuels. Hence the importance of the terms used to designate them.

The term « biofuels » is used by the industrial players and public authorities, within the framework of the marketing set up for their promotion. There isn't an ounce of « bio » in these productivist industries : huge monocultures, massive use of fertilizers and pesticides, GMOs foreseen, etc.

Another term used is « necro fuels », because their can provoke death : agrofuels are made from agricultural products destined to feed millions of people, mainly in the most vulnerable regions.

Agrofuels are used in three main industries:

- For gasoline engines : ethanol and its derivatives from cereals (wheat, corn) or sugar plants (sugar beet, sugar cane) ;

- For diesters (diesel engines) : extracts from vegetable oil, animal fats and derived products (diester), extracts of oleaginous plants (oil palm tree, jatropha, soya, colza, sunflower, etc) ;

- For biogases : methane which is made from the fermentation of organic matter (food waste, straw, crop products, etc).

1 – Situation and Perspectives

The world agrofuel production is currently dominated by the Americas and by one type of fuel : ethanol, extracted from US corn and Brazilian sugar cane. These two countries control 72% of the world ethanol production.

At world level we have 1400 million hectares of arable land at our disposal. Counting one ton of fuel per hectare, we would obtain 1400 million tons of oil equivalent (toe), if we were to use all this land for its production. In other words, without eating anything at all we could run – with the fuel made from agricultural products – 40% of the cars now in circulation.

In 2007, agrofuels represented 1% of the fuel used in the world. The aim is to reach 3.5% and more if possible ; hence the pressure on the prices of food products. To answer their needs, the industrialized countries of the North turn to the Southern hemisphere for production.

Brazil can produce 6,000 liters of ethanol from one hectare of sugar cane, i.e. five times more than the United Kingdom is able to produce from colza. Moreover, ethanol production is twice less expensive in Brazil than in the United Kingdom. Brazil wants to replace 10% of the world fuel consumption before 2025, thus multiplying by 5 its land used for sugar cane production. 200 million hectares of dry tropical forests, swamps and damaged land have already been deemed apt for agrofuel production by the government. Soya is already used for 40% of the agrofuel production.

More and More Agricultural Land Used for Agrofuel Production?

In the United States, in 2006, the production reached 19 billion liters of ethanol, with 55 million tons of corn used for its production (i.e. 20% of the corn production in the country) ; and by 2022, the foreseen production will reach 136 billion liters, which should cost at least 135 billion dollars for the country's taxpayers, due to subsidies. This ethanol is produced from corn which is free of taxes (51% of its normal price), which reduces its production costs.

In Europe, it is foreseen that these fuels will cover 20% of the road fuel used in 2020. In France, the aim is to mix agrofuels with traditional fuels up to 7% by 2010 and up to 10% by 2020. Surfaces : in 2006, of 13 million hectares of cultivated land, it is foreseen that 2 million hectares will be used for agrofuel production, i.e. 15% of the cultivated land.

These objectives go way beyond the agricultural production capacities of the industrial countries in the Northern hemisphere. Europe would have to mobilize 70% of its arable land to honor that bet and all the corn and soya production of the United States would have to be processed to make ethanol and biodiesel.

In Burkina Faso, a company massively produces jatropha seeds and wants to create tree nurseries in order to introduce this crop in the whole country. A study is currently being carried out on the treatment and processing of cotton seeds for agrofuel production, with a grinding and distillation plant for ethanol production. The country's production capacity could reach up to 60,000 tons of oil for fuel use if all the production and investment condition were met, which is still far from being the case.

In Cameroon, the Bolloré Company (France) controls 40,000 hectare of palm oil trees. From 2001 to 2006, 30,000 hectares have been cleared for oil palm cultivation. The aim for 2010 : 50,000 additional hectares, with subsidies from the IMF (International Monetary Fund) and the WB (World Bank).

In the Democratic Republic of Congo, the State signed a contract with a Chinese company to use 30,000 hectares for planting oil palms.

Indonesia and Malaysia provide 85% of the world agrofuel production from oil palms. This agro-industry employs in South-East Asia more than one million people and generates billions of dollars in revenues. These two countries want to increase their production by 6 million tons a year to respond to the countries in demand. Indonesia, the second world exporter, aims at becoming the main provider at world level by 2009.

In Colombia, the land used for agrofuel production has increased all over the country and went from 170,000 hectares in 2001 to 300,000 hectares in 2007, with the project of reaching 6 million hectares in 2015. In March 2007, Colombia declared that it wanted to become the first Latin American biodiesel producer, thus reaching the fifth rank in the world's palm oil producers.

Alliances between Oil Producers, Cereal Growers, Agro-Food Companies and Distributors

The International Energy Agency estimates that, in the 23 coming years – i.e. by 2030 – the world could produce up to 147 million tons of agrofuels. This represents an increase multiplied by ten in 25 years. Moreover, the annual increase of oil consumption is of 136 million tons : this production increase will consequently not compensate for the annual increase in oil demand.

For the future, the companies aim at producing cellulose GMO plants, and more specifically fast-growing trees that decompose easily to liberate sugars, these are called « soft trees ». They are genetically modified trees, only to produce more cellulose : not wind-resistant, with GMO pollen disseminating everywhere. They also have projects to make corn stalks and leaves more cost-effective or the using of « Elephant Grass » - also called « Chinese reed » to produce ethanol. These are the so-called « second-generation agrofuels ». They are thus agrofuels made from non-edible plants or from edible plant waste which therefore are not in competition with the food chain. There is a lot of research going on and each day brings many new developments.

The oil groups, cereal growers and transgenic crop producers reinforce their presence in the whole agrofuel production and processing chain. Cargill and ADM control 65% of the seed market while Monsanto and Syngenta, two agro-food industry pillars, dominate the GMO market. They are surrounded by a cohort just as powerful of raw material processors and distributors, themselves associated with supermarket chains as well as agro-chemical, cereal-growing and agricultural machinery companies (out of 5 dollars used for buying food in the world, 4 dollars correspond to the activities of all these companies).

The Golden Hope Company (Malaysia), which has processing plants in Malaysia and Indonesia, owns a palm oil processing unit in Rotterdam (The Netherlands) where the boats from Asia arrive.

The Actions of the Trans-National Companies (TNCs)

Present in the whole agrofuel process, the TNCs act and put pressure in different fields :

- **On the States,** so that they grant permits to use forest land – sometimes playing arsonists to speed up the process and also to have cash crops. For example, the Malaysian company Golden Hope convinced Venezuela to triple its surface of palm oil tree plantations in a few years.

- **On the indigenous people :** especially those who live in the forest – expulsion, immigration, threats with violence and military repression, violations of their basic human rights.

- **On farmers :** they are dispossessed of their land which is annexed and bought for ridiculously low prices. These companies supported by the States even go as far as using their armies to get want they want. The farmers are compelled to work on their plantation, to get into debt so as to buy the raw materials and transport means and to wait for three years for hypothetic results.

- **On the world market :** competitiveness, concentration of capital power in the hands of a few players. When the companies set up a cooperative-type of organization it is only a façade, the power is in the hands of someone chosen by them or in those of the local authorities who are only there to make sure their order is respected. An example : the three main actors from Malaysia have decided to merge and created an industrial giant which already controls 6% of the world production.

By creating a new industry for corn, the demand was artificially swollen and thus voluntarily triggered the price increase. Behind this speculative manipulation, we find the players of the industrial agriculture, the giants of the chemical and GMO seeds sectors and their allies in the automobile industry as well as the large banks. It is in the interest of all the industries that invest in agrofuel production to see it developed. Meanwhile, the citizens pay – as taxpayers – for the tax exemption schemes on the hectares of land destined for ethanol production while being the victims – as consumers – of the rise in food prices.

The speed with which the mobilization of capital and the concentration of power take place in the agrofuel industry is breathtaking. Private funding proposals flood the public research institutions, as in the half-billion dollars subvention granted by BP to the University Of California (USA). The large oil-producing companies, cereal growers, automobile and genetic engineering companies reach strong partnership agreements.

The States, accomplices of the TNCs almost always favor the development of intensive industrial production modes, with objectives that are based on the use of large-scale farms where everything is calculated. A French bank, associated with another group, holds 40 % of the Diester Industrial International Company and owns millions of hectares of land in Argentina and Uruguay to produce green fuels.

In South Africa, Ethanol Africa aims at having set up 8 plants by 2010. The number of cars in Africa should increase by 50 % in the next 10 years. Ethanol Africa also foresees to invest in the neighboring countries. It is the only continent with a vast surplus in cultivable land.

Which Impacts?

The main thing is to keep a certain distance before jumping without thinking into these productions, it is essential to maintain the precaution principle.

Which are the short and long-term impacts of an intensive agriculture ? Some questions have to be raised :

- What is the outcome in terms of ecological and environmental protection, which fertilizers, which pesticides, what is the risk for the population (allergies, infertility risks for instance)?
- What level of water consumption, knowing that certain cloned plants use up a lot more water than « wild » plants and that an industrial type of production requires much more water than « family» agriculture ?
- What emissions (CO_2 and other greenhouse gases) in the packaging, consumption, waste management and transport of these agrofuels ?

We should not forget that an agrofuel can be a source of life for a rural community and a source of death when produced on a large-scale basis and that all agrofuels are not environmentally equal.

To avoid slip-ups, it is necessary to set up production criteria that are environmentally and socially acceptable in order to avoid taking large surfaces of land away from food-producing agriculture and creating an agriculture that uses polluting methods. It is necessary to focus on the human aspects before profit.

Proposed Questions to the Groups and Movements :

- *What are the crops used for agrofuel production in your region and in your country ? What do you know about them exactly?*
- *How do the populations react to these realities ?*
- *Who are the promoters of agrofuel production? Who are the funders and which are the financial companies that play a role in this industry?*
- *What is the position of the State and the public authorities in the development of agrofuels?*

2 – Agrofuels Versus Human Rights

Intensive monocultures for agrofuel production make food-producing cultures disappear and do not leave any room for food self-sufficiency. This competition endangers the right to food, land, drinking water, farm seeds, natural resources, as well as the right to produce, process and sell products in a fair way. It endangers the right to live in dignity without repression, violence or torture; it questions the right for indigenous people to live in their ancestral land and the right for communities to live in peace in a healthy environment.

2-1 – Right to Food

Reminder : The right to an adequate diet requires everyone to have access – physically and economically – to sufficient food from a nutritional point of view. It imposes on the governments the obligation to respect, protect and ensure the implementation of this right.

The traditional function of agriculture is in grave danger. It is no longer used to provide food to human beings, but rather to hijack from the food chain raw material – that is essential to life – to the benefit of the automobile industry. It is a competition between the production of food and agricultural production to make agrofuels. Many countries of the South already have a deficit in food production for their population. The development of the agrofuel industries will only reinforce their food « insecurity ».

The poorest people spend 50 to 80% of their earnings on food. They suffer when food prices rise due to the high prices of fuel-producing cultures. Every time the price of food rises by 1%, 16 million people fall into food insecurity. If the current trend continues, 1.2 billion inhabitants could chronically suffer from hunger by 2025. In that case, international food aid will probably not be a great help since our agricultural surpluses will go … into our fuel tanks.

The agricultural production to make 50 liters of agrofuel equals the food a child needs in a year. In order to fill up the tank of a 4x4 you need what equals to a portion of cereal for one person for a year.

In Mexico - that imports 30% of its corn – the growing demand for ethanol triggered a huge pressure on the price of that cereal with a dramatic increase in the price of tortilla, a basic component of the Mexican food diet : more than 14% in 2006.

Ethanol production from manioc threatens especially those who are most destitute. Manioc satisfies one third of the caloric needs of Sub-Saharan African populations and is the main food ingredient for more than 200 million Africans who are among the poorest of the continent. Because of its high starch content, manioc represents an excellent ethanol source.

« After the production of foodstuffs, the renewable energy culture is about to become the second objective of Fribourg farmers » says a Swiss agricultural representative. The Swiss movement – ACAR – thus poses the question of a society choice : « There is indeed a risk that our food will increasingly come from products from elsewhere, which means : transport, high costs, pollution. Do we want the short food channel to prevail? And what, then, of the food sovereignty we defend ?? »

2-2 – The Right to the Land

The development of agrofuels creates conflicts in the access to the land : expropriations, land allocated to agrofuel production, to the detriment of local and indigenous communities. For instance, in Ghana, a Swedish company owns 10,000 hectares used to produce sugar cane.

Hundreds of thousands of people – farmers and indigenous – are displaced in a geographic area called « The Soya Republic » (Brazil, Argentina, Paraguay, Bolivia). The expulsions are brutal, often with the help of paramilitary brigades which seized the opportunity to take away the indigenous people's land. Trade-unionists, social and farmer leaders are murdered, massacres and unforeseen disappearances occur, money is laundered.

In Indonesia, indigenous tribes who live from hunting, fishing and plant-picking are chased away in large proportions from their forest villages by fires ; their land-ownership rights are not recognized ; this violence already led to a dozen murders and hundreds of torture cases.

The sell-off of food-producing cultures is not the only fear : agrofuel production necessarily means the concentration of land ownership, deforestation, soil, water and air pollution and the expulsion of the farmers.

2-3 – The Rights of the Displaced People

On the one hand, we are faced with a forced displacement of populations. It is estimated that there are in the world 60 million displaced people, due to agrofuel production, out of which 5 million are in Indonesia. The multinationals, and even the States, force populations to leave their homes so as to use their land for oil palm production, when the States – according to International Human Rights – should protect people who are obligated to be displaced within their State.

On the other hand, populations are compelled to integrate themselves into the financial mechanisms of agrofuel production. The indigenous people have to buy their land in order to be able to stay, and by so doing get into debt. In this way, they become dependant from the banks and trans-national companies (TNCs), thus becoming slaves who work in the sugar cane fields or in oil palm production.

2-4 – The Right to Health

In Indonesia, those who work in the plantations and extraction plants do so in very bad salary and status conditions and are in a dependency situation. There are dangers to the health : skin and nail illnesses, nosebleeds, eye infections, stomach ulcers, fertility and pregnancy problems, etc. provoked by the use without precautions of more than twenty pesticides (among which paraquat, the most harmful herbicide, which is banned from use in many countries).

Ethanol is as unhealthy for the lungs as gasoline. It is considered as toxic as gasoline by the American Environmental Agency. If all the cars in North-America were to run on super ethanol (85% ethanol, 15% unleaded by 2020), the respiratory problems due to air pollution would occur with an over-mortality rate of 4%.

2-5 – The Right to Decent Working Conditions

Oil palm production is not very remunerative for producers : the preparation of the land is expensive and so are the seeds. Most farmers go into debt to make the necessary investments. The reimbursement of their loans cut their modest earnings by 30%.

Salaries and working conditions in the oil palm plantations are often appalling, especially in the countries where social rights are very limited or non-existent. The workforce, made up of seasonal workers who earn 1.28 dollars per ton of cut sugar cane, is grossly exploited. These extreme conditions already led hundreds of workers to their deaths.

In Brazil, 100 hectares used in family farms provide at least 35 jobs, when 100 hectares used for industrial sugar cane production and oil palms only provide 10 jobs.

2-6 – The Right to a Healthy Environment

Deforestation

Important destruction of the forests : In Malaysia, between 1985 and 2000, the development of oil palms for agrofuel production was responsible for 87% of the deforestation. In Indonesia, the oil palm plantations are the main cause of forest decline ; by around 2020, these surfaces will have tripled, to reach 16.5 million hectares (the surface covered by England and Whales together) with a loss of 98% of the forest area.

Soya already provides 40% of agrofuels in Brazil : the more soya price increase, the faster the destruction of the Amazonian humid forest : 325,000 hectares a year, at the current pace.

Pollution and Global Warming

The industrial cultures used for agrofuel production require massive spreads of fertilizers. These are produced from oil – their world consumption is of 45 million tons a year. As a consequence, the level of biologically available nitrogen has doubled, thus contributing to nitrous oxide emissions, a greenhouse gas with a global warming potential 300 times higher than that of carbon dioxide.

Each ton of palm oil contains as much carbon dioxide as oil. Ethanol produced from sugar cane cultivated on cleared tropical forests releases more greenhouse gas than the production and use of the equivalent quantity of gasoline.

To obtain a liter of ethanol you need 3 to 5 liters of water and you produce up to 13 liters of waste water. You would need the equivalent of 113 liters of natural gas to treat this waste water, hence the high probability of rejecting it in the environment without treatment, thus polluting rivers, streams and ground waters.

Even the OECD (Organization for Economic Cooperation and Development), in a report from 2007, points out all the weaknesses of agrofuels : their response to the global warming challenge is negligible; they provoke food deficits, the destruction of natural habitats and will be very costly in terms of production subsidies.

Biodiversity

Millions of species are at stake and many ecosystems will be destroyed. The forests of Papua New Guinea, which only cover 0.3% of the world's surface but harbor 5% of the world's biodiversity are coveted by the trans-national companies for oil palm production.

In 15 years, 98% of the Malaysian and Indonesian rainforests will have disappeared and with them, many wild species due to the destruction of their habitat. Indeed, many forests are currently being cut in a rampant rush to produce palm oil.

In Indonesia, oil palms threaten human beings, orang-outans and the Indian elephant. In Africa, the Congo basin is threatened. In Brazil and Latin America, sugar cane and soya are planted everywhere – to fill up car tanks – to the detriment of the forest and the « cerrado », which are unique ecosystems. Agrofuels are war and death weapons.

Proposed Questions to the Groups and Movements :

- *In your country, your region, what are the consequences of agrofuel production development on the various human rights ?*
    - *Right to food*
    - *Right to the land*
    - *Rights of the displaced people*
    - *Right to health*
    - *Right to decent living conditions*
    - *Right to a healthy environment (deforestion, pollution, biodiversity)*
- *Who are the main victims of the violations of these rights ?*
- *How do the affected populations react and struggle for the preservation of their rights ?*
- *With whom do they form alliances ?*
- *What are the results obtained from these struggles ?*

3 – Perspectives for Actions

The production of agrofuels is unacceptable if it triggers more hunger and water shortages, as well as human rights violations. What, then, can we do? This is not a catalogue of possible actions but rather a series of ideas and perspectives for possible actions. It is up to each movement to find on the ground the means to have human rights respected and to ensure the future of humanity.

Jean Ziegler, Special Rapporteur for the Right to Food in the UN Human Rights Council, in his 2008 report, recommends that the States observe a 5 year moratorium in agrofuel production. In his report, J. Ziegler says : « *The States should impose a 5 year moratorium on all initiatives aiming at producing biofuels from foodstuffs. They should make sure that biofuels are produced from non-food producing plants, agricultural and vegetal waste rather than food crops, in order to avoid a massive increase of food, water and land prices and to avoid the use of these resources for any other end than food production. For this, they will have to immediately and massively invest in « second generation » technologies to produce biofuels* ». (Report A/HCR/7/5 – N° 77 e). Let us underline here that J. Ziegler uses the term « biofuel » where we believe the term agrofuel « agrofuel » should be used (see « Definitions » at the beginning of this document).

Various measures can be implemented during this moratorium to make sure that the right to food and other human rights are respected :

+ Are agrofuels necessary ? It is the first question to ask ourselves in our own country's situation. Locally, what are the possibilities to develop truly alternative energy sources, without depending on agrofuels ? How to act in order to make sure that the right to food and the right to food sovereignty are respected and implemented ? We should also look at how agrofuel production destroys local food agriculture and destroys the rights mentioned in the former part of this document.

+ **Raising the awareness of the public opinion** on the need to reduce global energy consumption and focus efforts on all other methods that allow improving the energy yield. This requires a true and contradictory public debate.

+ Act collectively to save energy – Starting with massive energy savings ! Then, consuming « our » local biomass and our urban and rural waste. It is necessary to collectively elaborate alternative solutions, turn them into demands and mobilize the oppressed and exploited in order to implement them. In the rich countries, the demands should be extended and combined with emergency demands such as the radical reduction of fossil fuel consumption, the setting up of oil reserves destined exclusively to emergency transport, social equipment, winter heating and the production of necessary goods.

+ Developing local productions of energy sources which are not in competition with food cultures :

- On relatively reduced surfaces which do not infringe on food cultures ;
- Within the framework of projects implemented and managed by local communities, so that a real ownership can take place among producers, users and beneficiaries – the only guarantee for success ;
- First for their local energy needs : access to electricity by supplying generators for the essential energy needs, such as running a mill or a husking plant, lighting the maternity ward or the study group for children in the evenings, maintaining the cold chain or other local community needs ;
- To carry out well-managed local projects, such as the use of cotton seeds in Burkina-Faso, or the replacement of the groundnut crop by sunflower in Senegal. And setting up strategies at short, medium and long term.

+ Adopting technologies that use non-food cultures, specifically those which can be cultivated in arid regions. This would be the case of the « jatropha curcas », a small shrub that produces large oleaginous seeds and that can be grown on very dry land. This crop could increase soil productivity, offer a means of subsistence – for instance in Africa – and reverse the land degradation and desertification.
We should however be very careful : many large surfaces are deforested, and people are starting to use arable land to increase the jathropha yield. Always in the name of productivity, people use more and more water – which is precious in the semi-arid regions. Moreover, many projects were taken over by the TNCs and no longer benefit the poorest local populations.

+ Making sure that agrofuels are produced by a family and farmer agriculture rather than industrial agriculture. In this, the States have a responsibility in protecting and respecting the right to food. For example, by creating cooperatives of small producers who would give their harvests to processing companies in order to create more employment and rural development.

Proposed question to the groups and movements :

- *What is the agrofuel production situation in your country ?*
- *What are the means at your disposal to analyze the situation and plan actions ?*
- *Which obstacles have you met in your action : from the State, the local and international economic powers (TNCs, pressure groups, etc) ?*
- *What are the actions you have set up to counter the development of agrofuels ? With whom? With what results ?*

Annex N° 1 – Glossary of Key Words

Agrofuel or biofuel:	See « Definitions » at the beginning of this document ;
***Agro* diesel**	Fuel produced from oleaginous plants (colza, sunflower, groundnut, and soya) by low-temperature pressure). Added to diesel oil, it can be used in diesel engines ;
***Agro* ethanol**	Fuel obtained from vegetal material (cereal, sugar beet, sugar cane, wood) that can be added to gasoline ;
Biomass	Material from vegetal or animal origin which is used from producing electricity, heat or fuel. E.g. : wood, composting waste or from water purification plants, cultivated plants ;
Esterisation	Extraction (for instance from oil) through a chemical process – contrary to pressure which is a physical extraction ;
Fermentation	Transformation with yeasts (naturally present or added) into ethyl alcohol ;
Hydrolysis	Decomposition of certain chemical components through water ;
Methanisation	Transformation into gas.