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THE IMPORTANCE OF BIO-FUEL IN THE AREA OF RENEWABLE ENERGIES

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Rezumat: *Bio-energia este acea energie obţinută din biocombustibili (combustibili ecologici). Astăzi, biocombustibilii bine-cunoscuţi sunt etanolul şi biodieselul. Aceştia sunt obţinuţi din plante şi folosiţi predominant în transporturi. Pot fi folosiţi în formă pură, dacă motorul este adaptat pentru aceştia, sau amestecaţi cu combustibili fosili. Combustibilul biologic poate fi produs din orice substanţă biologică ce conţine amidon, zahăr sau ulei. Acestea sunt obţinute cu precădere din plante precum porumbul, soia, rapiţa, trestia de zahăr şi palmier. În viitor, ar putea fi obţinuţi din biomasă, incluzând deşeuri şi alge. În urmă cu câţiva ani, biocombustibilii erau văzuţi ca soluţia pentru problemele legate de schimbările climaterice. Astăzi, însă, există voci care susţin că biocombustibilii, chiar din punctul de vedere al schimbărilor climaterice, nu reprezintă o parte a soluţiei ci pot reprezenta, parţial, o nouă problemă. Obţinuţi din cereale, plante oleaginoase şi trestie de zahăr, ecocombustibilii pot contribui la reducerea emisiilor de CO_2, precum şi a dependenţei de combustibili fosili. Bio-etanolul este produs din cereale, iar uleiul biodiesel poate fi obţinut din rapiţă sau floarea soarelui şi se poate folosi pentru motoarele diesel.*

Abstract: *The bio-energy is that energy obtained from bio-fuel (eco-fuel). Today, the well known bio-fuels (the biological ones) are ethanol and biodiesel. They are obtained from plants and used mostly in transportation. They could be used in pure form, if the motor is adapted to them, or mixed with fossil combustibles. The biological fuel can be produced from any biological substance that contains starch, sugar or oil. These are, mainly obtained from plants like corn, soy, rape, sugar cane and palm tree. In the future, they could be created from bio mass, discards and algae included. A few years back, the bio-fuels were seen as the solution for problems linked to climate changes. Today, there are voices that say the bio-fuels, even from climate changes point of view, are not part of the solution but part of the problem. Obtained from cereals, oleaginous plants and sugar canes, the eco fuels can contribute to reduce the CO_2 emissions as well as the dependency of fossil fuels. The bio ethanol is produced from cereals and the biodiesel oil can be obtained from products like rape and sun flower and employed in Diesel motors.*

Key words: bio-fuel, eco-fuel, bio-energy, renewable energies

Jel classification: O13, Q00, Q27, Q54, Q57

The eco-fuels can be mixed in different proportions with gas in order to create a mix to be used as fuel. The biodiesel oil reduces the CO_2 emissions with nearly 90% and the sulphur emissions with 98%. The United States are the leader in this new industry , with a production of 18.9 billion litres in 2006, followed by Brazil with 17.3 billion litres, while the UE has produced the same year, only 1.6 billion

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in cooperation with USA.

Bioethanol is made, in USA, from corn and in Brazil from sugar cane. The UE is using a mixture of wheat (36%), raw alcohol (22%) and sugar-beet (16%) and rye (15%).

The first generation of bio-fuel is obtained from wheat, corn, sugar cane, rape and other oleaginous plants to which is added an additive that, usually, increase the CO_2 emission by burning the respective bio-fuel. The second generation of bio-fuel is about to be produced soon using a particular handled biomass (straw or saw dust) but, for now, the production in an experimental stage.

The unknown factors of bio-fuel industry

The first elements to be taken into consideration, by the ones that develop the production of bio fuels, are the environment factors. The concern regarding the surrounding environment has reached the maximum limit when thousands hectares of tropical forest were burnt in several countries to make place for palm tree plantations. Palm oil is used as staple for bio-fuels. The impact over the other crops like the jatropha (a plant that grows rapidly and produces toxic vegetal oil) is still unknown. Though, the subsidies given to this field, the importation taxes and the governmental regulations have answered to a certain extent to both the request and the profitable nature of this industry. As the power policies of many states are still evolving, this field's regulations are maybe, the biggest element of uncertainty. The diminution of the subsidies, for example, may lead to profit loss.

There are three variables to be taken into consideration in order to delimit the direct effect on profitability and the impact of bio-fuel on surrounding environment: the cost and availability of the rough materials, the governmental regulations and the technological conversion. All these are part of the process, so an investment made now is a bet that must consider the evolution of these elements strongly connected among each other. The cost of crops that could be transformed into bioenergy varies a lot from one region to another and could change meaningfully in the following years. Then, the governments can change the rules that govern the industries in order to adjust to the priorities connected to climate changes. The energetic value, cost, efficiency of some bio-fuel are already different and the technological conversion in all its implications (new factories made accordingly to the new environmental rules, new personnel training, investments in new technologies) could lead to even bigger differences.

The decisions regarding the place of production and the distribution market for bio fuels can affect the success of the business. Despite all these elements of uncertainty, there are many new-comers that start such businesses now. In many important industrial areas the winners were the new-comers. The ones who had the strength and intuition to implement the new technologies. The same, in

bioenergy industry waiting could be a costly strategy, especially because the resources and lands are essential for this kind of business.

The players of alternative fuels market must take into consideration an entire risks area as well as the fact that every adopted strategy need compromises. To bet on certain geographical areas and on certain technologies will make things more complex but can have as effect a risk diminution. The vertical integration, considering both the complexity factor and the cost factor, can be essential to consolidate this new, young industry. The goal of those companies intending to enter the game is to start the competition from top position, selecting from the numerous solutions, the most viable ones.

The biofuels industry is still young but is evolving more rapidly than many others. The companies wanting to become competitive faster on this market must define their strategies now, the specialists of McKinsey's consulting company advice. Billion of US dollars, Euros and pounds flow towards biofuels industry. The high and growing prices of classic fuels as well as generous legal background have brought to this new industry, healthy premises and maybe even a quick absorption of the investments.

At the same time, the success of these pioneers, the enormous potential we can catch a glimpse of in a near future, have raised the interest of many companies from petrol and agriculture industries, as well as from connected areas, like bio-technology, chemical industry, engineering or financial services. And, the perspective of a "green" future has captured the investors' attention, hoping the bio fuels would represent a happy union between the world energetic needs and the decrease of gas emissions

Demand and offer for bio-fuel

A few years back, the bio-fuel constituted a subject for research. As a result of oil crisis and increase in price of its derivatives, the suppliers have begun to use the existing technology and local resources to supply the market with only one bio fuel: the ethanol. This product is obtained from corn starch in USA, form sugar cane in Brazil and from rape seeds in Europe. Now, as the demand has grown, the companies produce and sell bioenergy in several geographical zones. And the things start becoming complicated.

The big companies started to take in consideration the location and the costs. These factors, much more dynamic than in other industries, are interconnected and almost always very uncertain. The crop costs and the governmental regulations are, also, important to any strategy. The expenses with the investments vary immensely from a region to another, especially in bioenergy industry. The crop costs are 50% to 80% of biofuel production cost. In USA, for example, the increase with 1 dollar in the corn bushel's price (bushel=volume measure

equivalent to approx. 35.23 litres), rise with 0.35 $ the cost of a gallon of bio ethanol. Then, many of rough materials for bioenergy can be used as food supply, so their prices can change within limits difficult to predict. The fermentable sugar obtained from sugar cane in Brazil, for example, costs with over 50% less than the sugar obtained from European sugar-beet. The subventions given by the state influence the costs of rough materials.

In many regions, the high demand of bioenergy influences both the rough material's costs and the available reserve of food. From 2003 until 2006, in the United States, the total amount of corn harvest for bio-mass went from 12% to 16%. The federal government established that by 2017.35 millions of gallons of alternative fuel will be produced and used every year. For half of this amount only, 40% of annual forecasted corn production of USA will be necessary. Therefore, there is no wonder the corn price has gone up. And the increase has been exponential every year: from an average of 1.9 $/bushel in 2005 to 2.41 $ in 2006. In the last part of 2007, on some markets, the corn price arrived at 4 $/bushel.

The increasing demand of bio-combustibles can cause unwittingly and uncalled for lack of balance, which can bring problems on the food markets. A good example comes from Mexico. As a result of using a great part of corn production to make bio ethanol, the tortilla's price has increased to exaggeration. The tortilla had the same demand on the market as bioethanol did.

The bio-fuel production costs around 2.9 $/gallon. In Germany, a governmental subvention of 1.81 $/gallon helped the producers to obtain a profit of 0.42 $ per gallon of biofuel in 2006. As the subventions for biofuel industry came from tax payer's money, a new class of millionaires have emerged and that was impossible to ignore. Therefore, the government decided that until 2012, the conventional fuel will be replaced with a mixture made by classic and alternative fuel. This decision grants the bio-energy producers the market for distribution, but a rather limited one. Eliminating the subvention may lead, in short term, to a bigger offer than demand, which would compel the suppliers to re-examine the risks. On this type of market, where the prices are made by the suppliers having small production costs but high selling prices, there aren't many companies willing to set out.

The impact of using a mixture of biocombustible and classic combustible is, also, uncertain. In the USA, for example, the management factors can decide between a mixture of 10% (the maximum admitted for existing cars) and 80% (for hybrid cars). In Minnesota, the officials have established already that, until 2013, the cars will be using a mixture of 20% ethanol and 80% gasoline. This regulation make effect on both ethanol and car producers. In the present, the vehicle companies are

still putting on the market cars with classic motors, but many of them have strategies for hybrid motors or for motors using over 80% bio fuel. So, the governmental decisions in bioenergy field will affect one of the most profitable industries in the word, the vehicle construction industry. Other policies are about to be changed also. With few exceptions, the regulations in USA and UE protect the native producers by using high importation taxes. These policies could change, however. The officials admit the fact that some regulations, like the importation taxes for bio-ethanol, but not for petroleum, could affect the power security. For example, when the officials will become aware the ethanol made from sugar cane minimizes the carbon emissions, the import restrictions will be removed. The consequences on the dynamic of this industry are difficult to forecast.

Accommodation of technologies and investments

In bio-fuel industry adapting the technologies and the investments could minimize the production costs. The differences in costs from a region to another will show in the near future, if the geographical strategies are valid or not. Let's take, for example, the bio-ethanol made by means of microorganisms from dunder. The last generation technology will allow the use of cellulose sugar (primary component of plants). The cellulose is found in various forms in nature, every one of them being very cheap. During the technological process, the rough materials will be physically and chemically processed by using enzyme that digests the cellulose in order to obtain fermented sugar. The technology necessary for each step of this process is still evolving.

We can see different production processes, projects for new refineries, and, implicitly, different costs for each type of technology. When this new technology, named lignocelluloses, will be available and viable, no sooner than 2010 after some appraisals, the production costs and carbon emissions will vary in accordance with the rough materials. And because the rough material depends upon geographical regions, its cost will mean everything for those regions.

The governments can help implementing the new technologies, but not without risks. In 2006, the Spanish government allocated 29 million $ to finance a Spanish-Argentinean research project. Also, the Department of Energy of USA announced that would give 385 million $ for six different research projects for production of cellulose ethanol. New technologies might bring to attention the bio buthanol, a biofuel with better performances than ethanol. As engineering is evolving towards new technologies, the diesel oil which has a low cost today, could be replaced by a biocombustible obtained from jatropha (a plant that can be cultivated on low productive fields and from which is extracted a low cost vegetable oil). These new technologies, nevertheless, would have to fight with

BTL technology (bio-mass liquefaction), technology which produce synthetic diesel oil and gasoline. All these innovations must be tested first from the production cost point of view. Therefore, the governments that look ahead should avoid those policies based mainly on present technologies and should invest in tomorrow. The companies entering the market now have to make an effort in order to minimize the uncertainties connected to governmental regulations and their unsteadiness. It's understandable that some trusts would prefer to wait as the new technologies take shape. Some companies and investors will try to obtain capital to start businesses before the new factories will actually be functional.

For the companies with long term strategies, waiting is the enemy, the most powerful argument being the limited bio mass resources. Producing biocombustible require large lands for bio-mass crops, the real estates are expensive and the world policy to stop the land clearing is an additional obstacle.

The way companies define their strategies depends upon the market they operate on. There are three different segments already representative:

- the owners. Little farming cooperatives, companies implicated in oil industry, factory owners that have already invested massively in production and sale of bio-fuels. These type of players are dealing both with long term uncertainties and the need to adapt to technological progress;

- the products and services suppliers (seeds suppliers for crops, equipment and bio-technology suppliers). They are already answering the new demands in bio-fuel production field. The strategies they use are not yet based on the location and affiliation to a region, and this can increase the risk;

- the traders (farmers, farming equipment companies, suppliers of fertiliser and logistics suppliers). They are the main beneficiaries of bioenergy industry development. Even the minimal increase of the global profit in this industry brings money inside their pockets.

All these players must combine efficiently and rapidly the criteria belonging to the technology and geographical zone. The future strategies depend upon the choices made now. And the developing biofuel industry has now an equal proportion of advantages and disadvantages.

UE and bio-energy

In UE, using bio-energy as an alternative power source gains more and more supporters on public level; therefore, several university education institutes have joint their efforts in European agricultural field and formed the, so called, Birmingham-Godollo axis, for which a team of scholars, specialized in upholding the accessibility of European projects system in bio-energy production field, is working. In 2007, UE have decided to increase the percentage of bio-fuel used in

transportation to 10% until 2020. The goal was fighting CO_2 emissions. Recently however, was seen that this type of fuel wouldn't decrease significantly the emissions and can even lead to forest destruction and food price increase. "Even in Europe the cereal prices has gone up. There are benefits, but we should produce bio-fuel considering the realities" Stavros Dimas, the European commissioner for environment said. On the other side of barricade, the representative of an independent group of scientists, Tad Patzek, declared: "I want to be clear: the idea of using bio-fuel on a large scale cannot be sustained". At the beginning of 2008, the UE recognized that were not predicted the problems which could have aroused when they started supporting the use of vehicles using bio-fuel.

Power safety is one of the reasons for using eco combustibles. Producing them could reduce the UE's dependency upon importations of oil and natural gas. Another reason would be protecting the environment: CO_2 emissions coming from production of eco combustibles can be compensated by plant's CO_2 assimilation in photosynthesis process, therefore this type of fuel have no influence on global warming. The European Counsel in March 2007 established that until 2020, 10% of total fuels used in transportation in UE will be represented by bio-fuel.

Intensive agriculture, which would produce rough materials for bio-fuel, sends out nitro oxide, a gas with greenhouse effect. Furthermore, the lands hosting tropical forests or meadows – which assimilate CO_2 – could be transformed into crops. They would contribute to global warming. The impact on environment will be intensified by the lost of biodiversity and water consumption increase – needed by production process.

The production of bio fuels could even have a social impact: conflicts for land in developing countries and the lack of food – as the crops will be used in biofuel production and the food price will go up.

One of the issues developed on the 4th of March seminar at European Parliament was the amount of greenhouse effect gas the biofuels would avoid. The European Commission says that these fuels determine a reduction of 30% in greenhouse effect gas. Instead, the Report of Agriculture Committee argues that it should be at least of 50% in order to deserve public support.

"One of the main benefits of bio-fuel is the increase in power safety, but when the only way to accomplish the objectives is to import 100% of that type of fuel, than supplying them is as vulnerable as supplying oil and natural gas" the European deputy and chairman of Agriculture Committee, Neil Parish said during the European Parliament seminar.

"The biological combustibles are grey", said during the seminar, Mrs Bas Eickhout from Environment Agency in Holland talking about the difficulty to established if bio-fuel bring more advantages or disadvantages The participants

attending the seminar agreed that the bio-fuel usefulness depends very much upon crops, adequate place and production volume.

During a debate on energetic safety and bio-fuel held on 5th July 2008, the director of International Energy Agency, Claude Mandil said UE must give up the energetic dependency toward Russia in the matter of gas supplies: "We must obtain what we lack by increasing the energetic efficiency, by increasing the utilization of natural liquefied gas, bioenergies, nuclear sector". he said during a meeting of European ministers of energy at Saint-Cloud, near Paris. "I think we have to come off the contradiction in which we've placed ourselves….We are concerned by the idea of not having Russian gas and verbally aggressive toward Russia... Let's stop challenging Russian sovereignty by claiming we dictate the energetic behaviour on it's own territory" he concluded.

UE could cover, from its own production, only 1/3 of necessary bioenergy in order to accomplish the 2020 objective regarding the combustibles utilized in transportation, which would increase the importations, states a report of European Environment Agency published by middle of 2008. The critics affirm this measure would intensify the clearings in developing countries and lead to food price increase. The report sent to the 27 members showed that UE would be able to cover, from its internal production, only a 3.4% of bioenergy needed in transportation by 2020. Claude Turnes, member of the European Parliament, has declared he would sustain the UE's target change regarding bio-fuel so that only 4% of transportation required bio-fuel would result from renewable sources by 2015. The UE objective has become extremely disputed when the food price increase and concerns of the clearings are considered.

Financial help for "energy crops"

The Direct Payments Administrating Committee has agreed in unanimity on the 18th of October 2007 upon European Commission proposal to reduce the surface for which the farmers could apply in order to have special aids for energy crops in 2007, as the eligible surface of 2 million hectare was outrun. Those aids were introduced by Agriculture Policy's reform in 2003 to stimulate the farmers to raise the bio-fuel and thermal energy production based upon bio-mass. Up to a maximum guaranteed surface of 2 million ha, the farmers received 45 euro/hectare if they had a contract with a collecting company ensuring crops would be used to obtain the adequate power products.

If the surface for which the farms would apply for aids is outrun, the granted aid decrease with a coefficient that ensures to avoid exceeding the total budget of 90 million Euros given by the UE. In 2007, the surface for which aids applications were made, has reached approx. 2.84 million hectares, so the coefficient was 0.70337. In other words, the farmers received 45 Euros/hectare for a little over

70% of cultivated land for which the established aid was received. "This payment is very useful in order to stimulate the European sector of bio-fuel. Already exists a compulsory objective for bio-fuel and a prosperous market for them", declares Mariann Fischer Boel, the European Commissioner for agriculture and rural development. Since 2007, the new countries that have joined the UE in May 2004 have become eligible. The maximum cultivated areas in order to produce bio-fuel have been extended for that reason from 1.5 to 2.0 million hectares, subventions being granted for 2.84 million hectares. Making the Commission's diagram easier has made it popular among farmers and processing industry.

Putting the diagram into practice begun in 2004 when the entire covered area totalized 0.31 million hectares. It increased to 0.57 million hectares in 2005 and to 1.23 million in 2006. The expansion in 2007 of these areas reflected the success acquired. The diagram is to extend further for Romania and Bulgaria. The farmer's interest in producing "energy crops" has grown meaningfully over the past 4 years with effects the initiators haven't considered at the beginning.

First unexpected effect – food price increase

The biofuels have forced the price of food to increase by 75% – over estimations – showed a Mondial Bank's report of first trimester 2008, report which contradicted the American government declaration which said the bio-fuel had determined the increase in food price only by 3%. The documents ascertained a cost increase of 140% of daily basket since 2002 to February 2008.

"Without increased use of bio-fuel, the global stock of grain and corn wouldn't have reduced so much and the increased prices determined by other factors would have been more reasonable", the report shows. The analysis made by Mondial Bank ascertained that the biologic fuel had shaken the food market in three ways.

The first one is by allocating a huge amount of cereals for bio-fuel production. In USA a 1/3 of cereal amount is destined to ethanol production, and ½ of vegetable oils in UE are used for bio-diesel oil production.

The second cause of the phenomenon is represented by farmer's motivation to cultivate plants for biofuel production.

The third cause is linked to cereals market speculators who raised the prices right away. Food industry associations have requested the European Commission to pay more attention in encouraging the bio-fuel sector development as it absorbes a big quantity of cereals and oleaginous plants to food sector disadvantage.

Another Mondial Bank report shows that the number of starving people was estimated, between 2001-2004, at 862 million, from which 830 million in developing countries. The continuous raise of food prices determined protests in several countries, from Haiti, Egypt, Cameroun and Nigeria up to Indonesia,

increasing the fears that more and more people will starve. Yet again, according to a report issued in September 2008 by Lourdes Vladimiou and Jordi Rosell, both professors at University in Barcelona, the bio-fuel production has raised the prices of rough materials – especially the ones of cereals and oleaginous plant – with 30-40%. The two professors emphasized in their report the difficulty in making any forecast in this matter and point out that, if the most important biofuels producers forecasts will come true and will be maintained, the impact on farming products price "could be brutal" and if other factors which have an influence on cereal and oleaginous plant prices remain the same, than their price on the market "could easily double". According to this report' estimations, the bioethanol and biodiesel production will represent in 2017, around 40% of USA's corn production, 66% of UE's vegetable oil production and 66% of Brazil's sugar production.

The efficiency of bio-fuel production

The bio-fuel production development depends upon several factors, the oil price at global level – a decisive element – to which is added the production's potential level, local and regional market's dimension, infrastructure investments, the export options or the market price of rough materials utilized to make biocombustible.

In the 2008, the biofuel production in China is not competitive because the price of rough materials is too high. The cellulose technology could decrease the production cost from 1.6 $/gallon to 0.6 $ which will make the Chinese bioethanol the lowest in the world. Also the price of cellulose ethanol production in USA and Brazil will continue to rise.

The factories processing the cellulose will replace the old production units if the cellulose technology proves to be less energy consuming than the one using corn or sugar cane. In Europe, the technology using cellulose could put in danger the companies using sugar cane to obtain bio-ethanol.

UE policy regarding biofuel's utilization and promotion is based upon the following factors:

1. *Stimulate biocombustible demand* through:

- revision of biocombustible Directive in order to tackle the following issues: to determine the national objectives for fuel market plus the obligations about biofuels; to guarantee a durable production;

- supporting the member states to take into consideration the second generation of bio-fuel , within their biofuel's obligations;

- introduction by European Council and Parliament of a legislative document in order to promote the market for vehicles using mixtures of bio-fuel.

The 2003/30/CE Resolution regarding the promotion of biofuel utilization established the following values: 2% in 2005 (reached only in proportion of 1.4%); 5.75% in 2010. This resolution reshape also the tax system for energy products and electricity (J.O. nr. 283 from 31st October 2003);

- using tax dispensations – many countries have done that already and others have introduced obligations regarding sales on the market of classic fuels in various combinations with biofuels;

- use of bio-fuel on markets offered by public and private vehicle parks; by the farming and utilitarian parks etc.

2. *Actions toward environment* through:

- examining the contribution of bio-fuel in decreasing the CO_2 emissions in vehicle parks;

- measure proposals in order to obtain maximum of advantages from biofuels use that could reduce the contamination, therefore the reduction of greenhouse effect;

- ensure the rough materials for biofuel production in UE and third countries;

- examining the limit values of ethanol content and other oxygenated compounds of petroleum oil, of petroleum steam compression and biodiesel content inside diesel oil.

3. *Development of bio-fuel production and distribution* through:

- supporting the member states and their regions to take into consideration the advantages of biofuel and other bioenergies use by preparing national strategies and operational plans through their cohesion and rural development policies;

- creation of a specific group to examine the possibilities the biomass and other eco fuels would provide as part of their national programmes of rural development;

- asking industrial concerns in order to justify technically the practices which could stop the introduction of bio-fuel and controlling the behaviour of these industries in order to ensure there will be no discrimination in using them on a big scale.

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