THE POTENTIAL OF POLAND'S BIO-PETROL

Yossi Mann

Abstract: *The aspiration to promote the bio-petrol industry is an attempt to provide a solution for some of the problems the European Union countries share, such as the decreasing importance of peripheral areas, the need to diversify energy sources and the commitment to the Kyoto Protocol. Once Poland joined the EU in 2004, it became committed to adopting the organisation's decisions regarding the bio-petrol industry and to keep up with EU production objectives. An analysis of the factors that influence the bio-petrol industry indicates that Poland has great potential in the field and the ability to become an important player on the market.*

Keywords: bio-petrol, environmental security, energy security, Kyoto Protocol, Poland

Introduction

According to the EU, the implementation of a bio-petrol industry and the need to subsidise it are justifiable because it contributes to reducing pollution, is a means to diversify energy sources, can help reduce unemployment, strengthen peripheral areas and to preserve Europe's agricultural areas. Bio-petrol's potential varies from country to country in accordance with social, economic, geographical and political conditions. Geographical factors that influence the industry are the amount of raw material a country has. The influence on the industry from the social point of view are factors such as public environmental awareness, "Green" organisation activities, the status of agricultural pressure groups, the structure of the agricultural sector, the extent of cooperation amid agriculturalists, educational levels, and the strength of the peripheral society. There are also factors linked to the political structure of a country, such as the status of parties affiliated to the agricultural sector and to Green issues, government commitment to EU resolutions and to the Kyoto Protocol, Public Administration efficiency, and the government's

perception of energy security. Additionally, economic conditions have a substantial influence on the various countries' bio-petrol potential. Indeed the ability of a country to invest in subsidies and the amount that it invests in public transport has much bearing on the industry.

In the European bio-petrol industry, Poland is a country with great potential, if based on a combination of the industry's objectives and the factors that influence it. Indeed, several matters on the Polish agenda can be resolved through bio-petrol. Moreover, Poland has many important advantages, such as a variety of raw material sources and wide-scale agricultural areas, an agricultural sector with significant political influence, its geographical position close to countries that use Green energy, high standard, cheap manpower, an industry that is just starting out, and a large population.

The aim of this research is to pinpoint Poland's bio-petrol potential. The research will examine which of the goals the EU has set for the bio-petrol industry have been achieved in Poland. The research will also examine the advantages and disadvantages of the Polish bio-petrol sector. The parameters used to analyse the industry can serve as a model for the analysis of other Polish industries related to bio-petrol because the raw material composition of bio-energy, government policy and social considerations all correlate with those of bio-petrol.

The article is written in a thematic manner and surveys the objectives of the bio-petrol industry defined by the EU. The article also examines the influence of the increasing emphasis on the environment in the Polish transportation sector, as well as Poland's social and financial considerations towards Green energy and the influence of those considerations on the bio-petrol sector.

Trends in Poland's Transportation Sector and Influence on the Bio-Petrol Industry

The European tradition of spreading and implementing new social and economic ideas has created global awareness about the environment in the last decades. The damage to the environment and to health attributed to greenhouse gas emissions has caused the EU to place the matter at the top of its list of priorities and adopt policies that aim at reducing those emissions. Over the years, the

European transportation sector has been designated as the main culprit of air pollution and CO_2 emissions. Indeed, between 1995 and 2004, emissions from the transportation sector rose by 35%, mainly due to the increase in vehicles on the roads and to improved infrastructure.[1]

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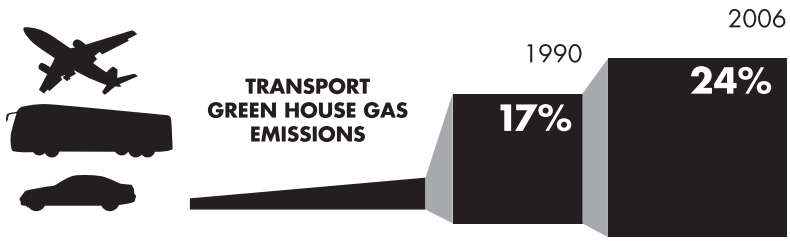
Info-Graph 1. Green House Gas Emissions from Transport



Source: European Environment Agency, June, 2008.

Poland has a longstanding motor industry, ever since the days when Fiat established its first factory there in the 1930s. The low cost of high-standard manpower combined with the fact that Poland has the sixth largest population in the EU have made Poland one of the most appealing countries for vehicle production and for car-selling companies. Poland had 5.26 million cars in 1990 and a reported 9.28 million in 1999, and its entry into the EU in 2004 contributed to further increase in its number of cars. Although there was an increase in the number of new cars on the roads before 2003, the number of second-hand cars rose even more significantly after Poland joined the EU, due to the cancellation of various taxes. As a result, vehicle imports grew from 50,000 in 2003 to 877,000 in 2004. The sharp increase in the number of vehicles in Poland will be the cause of a significant increase in air pollution in the years to come, and the Polish government, which wishes to conform to the accepted EU policy on greenhouse gas emissions, will need to provide solutions.[2]

The increase in the numbers of vehicles and the consequent pollution is also attributed to Poland's lack of effective public transport. An ambitious plan to lay down very expensive public infrastructure, combined with a reduction of government subsidies on

public transport since the 1980s, have dealt a fatal blow to the sector and have instigated the move to private cars. In addition, the closure of heavy industries in the 1980s caused a constantly lessening need for trains, which resulted in a sharp drop in their profitability. Moreover, due to the lack of efficient pressure groups such as iron and coal miners, government budgets for the purchase of carriages and laying down new railroad tracks were gradually reduced. Finally, the transfer of responsibility for municipal railways from the government to the local authorities made matters worse because of the high maintenance costs of the municipal railways (trams) and the need to buy new carriages, all of which caused less investment in new infrastructure and accelerated the transfer to private cars.[3]

In an attempt to improve the country's transportation system, the EU announced that it would transfer funds to the effect of $ 19,074,990,000 (USD) to the Polish government.[4] An examination of where that aid will be invested, however, shows that 60% of the budget will be used to build motorways and only 20% will be used for public transport. The rehabilitation budget for the roads is, in that respect, high, even when compared to other countries in the CEE-10. Moreover, the Polish government has reduced its investment into enlarging the national bus company and most of the country's buses are therefore at least 10 years old. All these factors indicate that there will continue to be an increase in the use of private cars in the years to come.[5]

The attempt to encourage the use of the aviation sector instead of trains and private transport is hard to implement in a country that has been classified in one of the last places in terms of airport quality. Moreover, Poland will have difficulty in building toll road infrastructure due to its cumbersome administration system and its conservative population.[6] This means that Poland's negative gas emissions record could get worse in the years to come because of the significant increase in private cars. Neglecting solutions such as encouraging the use of public transport at a time when population density in the main cities is on the rise could make it even more difficult for the government to solve the problem. Encouraging the use of environmentally-friendly petrol could therefore reduce the issues facing the country in terms of gas emissions in the years to come.

Poland's Bio-Petrol Policy

Government policy is of vital importance to the bio-petrol industry. A number of factors influence Poland's policy, and first of all, the government's commitment to EU resolutions and to the Kyoto Protocol. An EU report in 2000 determining that dependence on foreign energy sources was on a constant rise, for example, caused the government to take steps such as committing to buying electricity from renewable energy sources, and also to express its commitment to the matter of bio-petrol. Other than that, Poland's economic situation has an influence on the government's ability to promote the sector, and the benefits granted to the industry are therefore set every year anew, after the budget has been examined and after an assessment has been made of the loss of profits from taxes on Green energy products. Finally, the price of oil influences the government's decisions as whether to continue to boost bio-petrol or not. Indeed, substantial oil price increases render the use of bio-petrol worthwhile and reduce the need for significant government subsidies. Sharp decreases in oil prices, on the other hand, render the bio-petrol industry a burden on the country's budget.[7]

The Polish government's policy on bio-petrol is not as effective as that of Germany or France, despite the great raw material potential the country has. Between 2005 and 2006, there were many delays to the legislation and the establishment of standards for bio-petrol, proof of the local administration's inability to rapidly adopt EU resolutions. The fact that effective administration is one of the basics for Green energy is a stumbling block in Poland's attempt to make changes with far-reaching consequences. The attempt to blame the delay on the short period in which Poland has been a member of the EU does not fall in line with the fact that the number of rapeseed fields in the country has been on the increase since 2003. It would seem, therefore, that the Polish government's request that the EU lower the bio-petrol target to 0.5% instead of the 2% set in 2005 proves the link between the budget and encouraging the use of bio-petrol. Indeed, the economic hardships that faced the government at the time, combined with political disagreements between liberals and conservatives, influenced the authorities and prevented them from putting the legislation forward.[8]

The Polish government claims that its position towards bio-petrol must be based on the annual budget. According to estimates, the bio-petrol industry cost the economy 120 million Zloty in 2007 and 240 million Zloty in 2008 in government expenses. Due to bio-petrol's influence on the annual budget, the Polish government decided to have a single tax policy for all types of bio-petrol in 2007, which resulted in a sharp decrease in consumption. Many believe however, that the problem is not only the government's taxation policy but also its minimal support for research and development within the industry. For the sake of comparison, Sweden invested some € 88 million (euros) into 2nd generation bio-petrol research and development in 2006, Spain invested € 22 million (euros) and Finland invested € 9 million (euros), while Poland invested a mere € 68,000 (euros) that were collected by an engineers' association which does not receive any government support.[9]

Despite the limitations of the research and the hesitant support of the administration, the Polish government has decided, in principle, to promote bio-petrol. In 2007, the government announced its objectives for the coming years. In 2008, it set a target of 3.45%, in 2009, a target of 4.60%, and it aspires to reach the EU objective of 5.75 by the end of 2010.[10] Furthermore, in July 2007, the government decided to promote the bio-petrol industry with a plan – to be implemented between 2008 and 2014 – which aimed at improving the bio-petrol "food chain" from the agricultural stage to the refining stage. Moreover, it offered to grant tax benefits on cars suited for bio-petrol, but has not yet taken the steps to implement those plans.[11]

Can the Bio-Petrol Industry Reduce Unemployment?

In 2002, political elements associated with the agricultural sector claimed that encouraging the bio-petrol industry would ensure the creation of about 100,000 new jobs. In those days, unemployment had soared to 18.5% and many in Poland demanded investment into the industry in order to create more local employment. It is however, difficult to attribute the bio-petrol industry any significant contribution in reducing unemployment. Moreover, it is difficult to find data on the number of people employed in the industry and its

offshoots. Data from 2007, when the industry was at its peak, shows an increase of 3.2% in the number of jobs in the various agricultural branches and it seems that the initial estimates of a significant rise in employment were exaggerated. Furthermore, estimates of job increases are linked to 1st generation bio-petrol which was produced from two main crops: sugarcane and rapeseed. 2nd generation bio-petrol, which makes use of different raw materials, could therefore cause a significant decrease in the number of jobs promised by politicians and pressure groups.[12]

Several researchers have reacted with scepticism to the attempt to attribute bio-petrol influence on Polish employment. Most believe that even if more jobs were created in the bio-petrol industry, it would be at the expense of other sectors such as the coal and refinery industries. Therefore, the bio-petrol industry does not have any significant short-term direct impact on employment. According to estimates, if the bio-petrol sector comes to constitute 15% of petrol consumption, there will be 350,000 more jobs, but it will be at the expense of other sectors.[13]

The influence on *unemployment* depends on the government's role in the market. Countries that promote technological development such as Germany, Sweden, Denmark and Austria, believe that they will become the main exporters of renewable and Green energy machinery and therefore expect significant growth in employment numbers. Countries that have raw materials for industry – and are able to export more than they require for domestic consumption and do not require significant government subsidies – will likely succeed in stemming the decrease in jobs in the agricultural and service sectors. The bio-petrol industry is able to improve the economy in peripheral areas where there is a high dependence on various branches of agriculture. The number of people employed mainly depends on the number and quality of the facilities established, as well as the type of raw material used.[14]

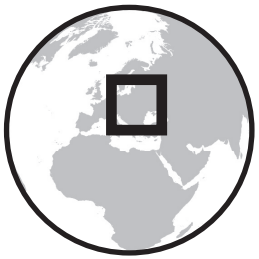
Bio-Petrol: A Means of Strengthening Peripheral Areas

93% of EU territory is classified as peripheral land and rural areas. 58% of the EU population lives on that land, and although the economic and infrastructural conditions of those areas vary from

country to country, the peripheral areas all play important social, economic and ecological roles. In recent years, a number of problems, common to all the peripheral areas of the EU, have arisen. First, the trend of urbanisation has left peripheral areas with an aging population. Second, soil pollution has worsened and water quality has deteriorated, mainly in Eastern and Central European countries. Third and finally, biological diversity has decreased and the accumulation of rubbish and debris continues to pollute the soil, all of which diminishes the status of European peripheral areas and has dealt a fatal blow to the agricultural sector. The fact that the EU considers it important to produce food that abides by exacting standards could, in the long run, have a negative bearing on the international influence of countries that produce agricultural goods.[15]

93% of Polish territory is rural and peripheral. In a long process that began in the 1950s, the rural population, which consisted of 57% of the entire population after the WWII, has dwindled. Between 1989 and 2002, there was a sharp increase in the number of people who moved from rural and peripheral areas to the big cities. This resulted in a crucial decrease in construction, a migration of young people and the decline in the percentage of women in peripheral society.[16] From the beginning of 2002 however, there has been a process of "return migration" to rural and peripheral areas due to a lack of work places, urban density, and village development (etc). This process will require the creation of new jobs in the sectors that are the mainstay in those areas, such as tourism and agriculture.[17]

The rural areas in Poland have developed a dependence on agriculture over the past decades. Despite a sharp decrease in jobs in the sector – from 26% in 1996 to 16% in 2003 – agriculture was the source of income for 40% of the rural population in 2006. To a great extent, the rise in the price of goods in recent years has justified continued dependence on agriculture. According to the Polish Bureau of Statistics, there was a significant increase in income from agriculture and in land prices between 2006 and 2007, with the average cost of land, for example, rising from 4000 Zloty to 5000 Zloty. Moreover, because Poland joined the EU, agriculturists have got more economic incentives in recent years.[18]



POLAND

Map: David Erkomaishvili

The importance of the Polish periphery to the EU´s economy, and to Poland's unique character, is reason for its conservation. In order to enhance the status of the Polish periphery, financial sources must be diversified, means of access improved, and educated young people encouraged to live there. The EU´s support for the Polish periphery – more comprehensive for Poland than for any of the other EU-27 countries and is estimated at $17.2 billion (USD) – demonstrates how important the EU considers that periphery to be and what potential it sees in it. One of the proposed solutions for the preservation of peripheral stability is to establish a bio-petrol sector that will contribute to economic diversification and strengthen the country's traditional structures.[19]

Other than its contribution to strengthening peripheral areas, bio-petrol also provides solutions for remote areas where energy is costly and inaccessible. Bio-energy is an important element in the general energy consumption of most countries. In Africa, for example, bio-energy makes up 47% of general energy consumption, in South America 18% and in Asia 29%.[20] The economic status of the EU countries limits the role of bio-petrol to total energy consumption. In peripheral and rural areas, however, the bio-petrol market plays an important role because access to those areas is difficult and because of the high cost of energy. In 2005, for example, only 17.5% of inhabitants of Poland's peripheral areas were connected to the national gas system, which is considered to be more expensive because of transportation costs. Developing an effective bio-petrol system could (partially) provide for the needs of the peripheral.[21]

The role of the peripheral areas in shaping Poland's economic, social and ecological structure compels the government to work towards growth in those areas. Many consider that bio-petrol is important for the strengthening of the economy and for the reduction of migration to the cities. It seems that the aspiration to bolster the peripheral areas is the most significant reason for encouraging bio-petrol development, but in order to help the periphery, pressure groups which can influence government policy need to engage in more direct action.

The Influence of Pressure Groups on the Promotion of Bio-Petrol

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In order to encourage the government to invest in the bio-petrol industry, there is a need for pressure groups to promote it. The political influence of the agricultural sector in France and Germany, for example, greatly impacted on the promotion of bio-petrol in those countries. In order to create effective public pressure however, it is not enough to activate the agricultural sector. Indeed, in order for a government to willingly reduce taxes on environmental-friendly oil, Green pressure groups need to infuse the industry with an ideological angle. The rise in the status of Germany's bio-petrol industry, for example, is also linked to the pressure the Green Party put on the government there.[22]

Poland's agricultural sector influences governmental structures but the country's agricultural organisations do not have the same influence as they do in other countries such as the US, Germany and France. There are less agricultural organisations in Poland than in any EU-15 country and they have less association with one another than is customary among their Western European counterparts. Differences in production capacity in the various agricultural areas and the lack of a free-market until 1989 prevented such organisations from having common interests, but since the beginning of the 1980s, pressure and political groups have become more powerful due to the rise to power of the Solidarity movement. Some of the organisations that influence the government's resolutions on agriculture are: the Federation of Large Scale Producers, the Polish Grain Chamber, the National Association of Farmers, Circles and Agricultural Organisations, the Polish Farmers Union, and the Self-Defence of the Polish Republic party whose leader, Andrzej Lepper, became Minister of Agriculture and Vice Prime Minister in 2006.[23]

The pressure groups seeking to promote the use of renewable Green energy were mostly established in Poland after it joined the EU. Prior, the matter was not on the public agenda because of the need to resolve the economic and social problems that the country had to contend with after the dissolution of the Soviet Union. In recent years due to the development of Poland's economy and greater exposure to Western European countries, public debate over Green matters has gradually entered the scene. Nonetheless, the Green

organisations' activities are still limited compared to EU-15 countries. Moreover, most Polish governments have not afforded great importance to Green organisation activities, and granting them few funding options compared to Western countries.[24]

Due to a lack of social organisations of any significance, pressure for the use of bio-petrol tends to come from agricultural organisations which considers the industry to be economically advantageous. In 2002 the Polish Peasant Party began to work towards legislating the matter of bio-petrol. Attempts to promote such legal trappings met with strong resistance from liberal-economic groups, and brought the Minister of the Economy to labour against such legal steps with the argument that legislating a particular sector of Poland's economy would likely produce spill-overs and could be detrimental to the economy as a whole. Alternatively, those supporting such legislation claimed that it would safeguard agricultural classes who feared further reforms (after Poland's membership to the EU) and lopsided competition with international producers.[25]

Pressure groups have a great influence on government policy. The change in Polish political structures, economic acceleration and the influence of the EU will give social and political organisations additional leverage in the years to come. It seems that the link between agricultural organisations and Green pressure groups will proliferate in the future in order to secure their common economic and ideological interests, similar to situation in Western Europe. Inter-group cooperation will ensure pressure on the government, provide the Green industry with more incentives and help implement EU resolutions on the subject.

The Bio-Petrol Industry and Energy Security in Poland

The EU's concept of "Energy Security" was expressed in the Green Paper on the Security of Energy Supply published in 2002, in line with the changes to global energy markets. The report was made because of the global trends towards open markets, China's rapid industrialisation, rising consumption of oil products in various Asian countries, tremendous fluctuations of the oil markets between 1998 and 2000, instability in the Middle East due to the breakout of the Al-Aqsa Intifada a month prior to the report's publication, tensions

in Iraq over weapons of mass destruction and estimate that the EU's dependence on foreign energy sources was on the rise. The report expressed fears of a lack of continuous oil and gas supplies and of the growing conflict between the superpowers over access to, and control over, energy resources.[26]

The conclusions of the EU report were reinforced by ensuing geopolitical events such as: Operation Enduring Freedom (Afghanistan, 2001), Operation Iraqi Freedom (2003), and the rise of oil prices in Russia. The fact that the EU imports 50% of its energy and that its dependence on foreign sources will probably reach 65% by 2030, has forced it to diversify its energy sources by means of Middle Eastern and Central Asian countries, but also to work towards producing its own sources.[27]

Changes to the global energy market have influenced Poland political choices and behaviour. Despite that it only joined the EU in 2004, energy security has been one of Poland's priorities for over a decade. Between 1990 and 2000 gasoline consumption in Poland rose by 90% and there are constant increases in gas and oil imports. The Polish government hoped that joining the EU would ensure it access to new energy sources and help it build an efficient logistics system and render it part of a unified energy security policy for dealing with energy crises.[28] Just one year after joining the EU, Poland was at the forefront of countries seeking solutions to potential energy disruptions and shortages. In 2005, Germany and Russia signed an agreement to establish the North European Gas Pipeline in the Baltic Sea, which ensured Germany diversified energy sources. As far as Poland was concerned, this symbolised fractured EU energy policy where each country secures its own energy sources without forming a united front to provide solutions for all EU members.[29]

The need for the diversification of energy sources intensified following several key events. The gas crisis between Ukraine and Russia (January 2006); for example, engendered a decrease of some 30% in gas supplies to several countries, including Poland, Germany and Austria. For Poland, this was clear evidence that Russia was set on using EU energy dependency to fulfil its geopolitical and geoeconomic aspirations in Europe. Furthermore, in 2009 the Ukrainian company RUE encountered difficulties in supplying

gas to Poland´s PGNiG, and Poland was forced to request gas from Russia´s Gazprom instead.[30]

The crisis between Ukraine and Russia, and the spill-over effects which limited gas supplies to Central and Eastern Europe, hardened Poland´s position towards its, and the EU's, energy security. Fears that Russia was using energy as a weapon to promote political goals, even if not entirely accurate, brought about the need for Poland to play an active role in pushing the energy industry to the fore, and Poland therefore proposed constructing intra-European energy pipelines to be used in case of prolonged disruptions. Also, the government ordered that the strategic oil reserve be enlarged to last for 90 days and intends to expand the national gas stock storage capacity from 11 to 30 days by 2012.[31] Additionally, the Polish government holds 84.75% of the shares of PNGiG, the country's largest gas company, 100% of Gaz-System, the Polish gas transmission system operator, and 100% of Pern "Przyjazn," the Polish oil pipelines operator, to prevent attempts of foreign energy companies from gaining control of significant portions of the Polish energy industry.[32]

The Polish government operates on several levels in order to diversify energy sources. For example, it decided to establish LNG infrastructure in the city of Swinoujscie in the North-West of Poland and signed an agreement with Norway in 2007 for gas to be supplied via the Energinet.dk pipeline from 2011.[33] While Poland is succeeding in diversifying its gas sources, it faces difficulty securing adequate access to oil. Indeed, 96% of Polish oil imports come from Russia, which means that disconnecting the oil pipeline between Russia and Poland would virtually paralyse the Polish oil economy. One way to minimize that danger is to import oil via the port of Gdansk. The Polish government has also turned towards the Caspian Sea countries in order to reduce dependence on Russian oil, and that has resulted in the establishment of the Odessa-Brody-Plock pipeline, which facilitates increased oil imports from Central Asian countries. Furthermore, the Polish government sought to sign gas and oil product supply agreements with Qatar and Saudi Arabia in 2009, although no significant breakthrough has yet been made.[34]

Despite the great importance the Polish government attributes to energy, the bio-petrol industry's ability to diversify energy

sources is very restricted. Production costs are high and the amount of raw material available limits the ability to contribute to lessening dependence of foreign sources. The bio-petrol industry has, however, proven to be a deterrent to sharp oil price increases. OPEC understands that oil price increases engender more investment into alternative energy such as bio-petrol, and indeed, the increase in crude oil prices has resulted in the acceleration of development and research into 2nd generation bio-petrol and raised public awareness on the subject. New technological developments can therefore slightly reduce dependence on foreign energy sources and be a deterrent against OPEC states and Russia, who will likely seek to raise oil prices in the years to come.

The Raw Material Potential of Poland's Bio-Petrol

Idle agricultural lands are required in order to produce substantial amounts of bio-petrol, and when the bio-petrol industry was starting out, several countries with vast agricultural areas joined the EU, Poland and Rumania were the most prominent in that they had the ability to become the main raw material producers for the biomass industry, and bio-petrol in particular. Despite their raw material potential however, most CEE countries suffered from symptoms of agricultural economies developed under Communist regimes where there was scant cooperation between agriculturalists, agricultural produce was low in relation to the size of the land, and there was a lack of educated manpower. In order to assume a leading role in the bio-energy field those countries need to make significant reforms, including the expansion of agricultural farmland areas and product quality control.[35]

Poland is a leading producer of several agricultural products; it is the 3rd largest rye producer in the world and 40% of EU rye is produced in Poland. It is also a top producer of raw material sources for the bio-petrol industry. For example, it is the 7th largest rapeseed producer in the world and the 3rd largest in the EU. Rapeseed crops in Poland constitute 10.7% of total EU production and 3.4% of global production.[36]

Table 1. Production in Top Ten Rapeseed Producing MS (1,000 MT)

	2006	2007	2008
Germany	5,337	5,307	5,300
France	4,124	4,600	4,500
Poland	1,652	2,125	2,200
United Kingdom	1,890	2,108	2,150
Czech Republic	880	1,031	990
Romania	170	352	650
Denmark	435	586	600
Hungary	338	494	570
Lithuania	170	330	350
Slovak Republic	260	321	347

Source: Gain Report EU-27 Oilseeds and Products Annual 2008.

Poland has land with the potential of producing about a million hectares of rapeseed per year but climactic conditions, particularly in the North of the country, affect produce and limit cultivation areas. Nonetheless, there has been a significant increase in lands allotted to rapeseed cultivation in recent years. Other than the traditional cultivation areas such as Pomerania, the number of fields in areas such as Lubelskie, Opolskie and Dolnoślą have been expanded. On average, 2.5–2.6 tonnes of rapeseed can be produced per hectare of land in Poland, but this varies according to the cultivation area and the season of the year. In the Northern parts of the country, and mainly in Szczecin, the average production is 3.2 tons per hectare, while it is 2.4 tonnes in Southern Poland.[37]

Poland's agricultural nature, cheap manpower and raw material capacity make it a country with high potential for the bio-petrol industry, and for biomass in general. Success however, largely depends on cultural, economic and social changes to Polish agriculture. First, Poland will need to enlarge the average farm to make the agricultural sector more appealing. Polish agricultural farms are normally much smaller than those in Western Europe because, during the Communist era only 20% of lands were state not owned and the size of an average agricultural plot in Poland was and is

set at 7.8 hectares whilst it is 46 hectares in Germany. Nonetheless, there has been an increase in commercial agricultural plots in the last few years. In some areas in Northern Poland, for example, there are agricultural farms with areas of between 100 and 500 hectares. Second, there has been an increase in the number of farms with an area of 20 to 50 hectares in the last decade and such farms consisted of 3.6% of the country's entire agricultural area in 2008, while they had consisted only of 2.4% in 1996. Furthermore, the total number of agricultural areas grew between 2006 and 2007 because more uncultivated lands were put to use. Finally, the Polish government is promoting laws to enlarge the average agricultural farm plot. According to a 2009 bill, for example, only one son will be able to inherit family land in order to enable the extension of the average size of farms.[38]

Improved agricultural produce and lower bio-petrol production costs are linked to agriculturalists' ability to cooperate with one another. The fact that the bio-energy market is composed of a long "food chain" demands that the various bodies involved work together efficiently. However, agriculturalists in Poland are not accustomed to working together for cultural and political reasons, and if there is any cooperation at all, it is generally more in order to safeguard agriculturalist rights than to improve the produce. Although strong cooperation occurs in Western parts of the country where there is a tradition of cooperative farms, the mass migration in the 1950s from Eastern to Western areas increased the number of cost-ineffective farms even in areas with a tradition of cooperation. The ramifications of not working together effectively include difficulties in purchasing production machinery, a lack of price coordination for goods and land, inferior bargaining power against the big factories, and a lack of understanding of market requirements. If educated young people move to agricultural areas, and farms are enlarged through the use of an effective enforcement system, there could, in the long run, be significant changes. The presence of German, Swedish and Danish companies in the Northern areas of the country, for example, has helped agriculturalists establish effective farms along the Scandinavian model.[39]

Bio-energy production is also affected by transportation costs of raw material to the factories. Despite EU support in establishing effective transportation, many areas in Poland lack suitable

infrastructure, which affects production costs. In a number of areas, mainly to the South and East of the country, it is difficult to transfer raw materials via truck or rail due to the narrow roads and a lack of railway tracks. Research has even shown that transferring raw materials such as biomass is not cost-effective if the transportation is by trucks that drive more than 100km to get to the factory. However, although, in most cases, raw material is transported to factories that are less than 100km away, transportation by truck often costs more because the trucks are old.

Poland and Rumania's difficulty in transporting raw materials is more obvious than in countries like the Czech and Slovakia Republics and Hungary. Nonetheless, in the areas of Lublin and Szczecin, which are considered to be areas with important raw material sources for the bio-petrol and biomass industries, the distance between the factories and the raw material areas is shorter than it is anywhere else in the CEE-10 countries. Moreover, the fact that North-Western areas are close to the Baltic Sea can contribute to the reduction of costs. Indeed, research shows that transferring goods by sea is the cheapest means of transport, which increases Poland´s future bio-energy role.[40]

Poland's Bio-Petrol Infrastructure

Investment into new facilities and improving the technology in old factories are indications of the bio-petrol industry's potential. Poland has much experience in producing bio-ethanol. Ethanol refineries have operated there for more than 600 years, although most of them closed over the last decades due to financial difficulties, a lack of supervision by the authorities, and decreasing demand. As a result, a number of ethanol refineries have taken steps towards modernisation, mainly by purchasing advanced equipment and reducing energy consumption to reduce operation costs. Those steps have engendered a positive change in the industry, and an estimated 200 refineries, which produce varying amounts of bio-ethanol, are currently operating.[41]

Bio-ethanol production calls for the use of dehydration equipment. This equipment first appeared in Poland in 1928. The international revival of the bio-ethanol industry has given a boost to the

equipment and as of 2008 19 such machines operate in Poland. Poland's experience, as well as the large amount of raw material available in the country, will make it possible to significantly expand bio-ethanol exports in the coming years. Indeed, a number of alcohol producers and companies that produce sugar have shown an interest in investing in the field, but the rise in raw material prices, as well as the Polish government's hesitation have put the projects on hold.[42]

The bio-diesel industry can be divided into two parts: the first part consists of cleaning and pressing the rapeseed and the second part is producing bio-diesel. There are, at the moment, ten major companies producing rapeseed oil in Poland. In 2007, eight other companies announced that they intended to open similar factories but suspended their plans due to increased prices of agricultural products and decreased oil prices. There are also other 100 or so companies that produce bio-diesel in varying amounts in Poland. The fact that most of Poland´s bio-diesel industry was established in 2004 ensures that companies have modern technological equipment developed in the West, but most suffer from a shortage of raw material and lack long-term contracts with agriculturalists. Should there be a significant increase in agricultural lands and should relations with the agriculturalists be resolved further investors will be able to establish new infrastructure.[43]

Other than establishing facilities, the industry also depends on effective bio-petrol station deployment. Installing many stations will ensure that people adapt to the product and that it enters public consciousness. In recent years, there has been a significant increase in the number of bio-petrol stations in Western Europe. In Germany for example, there were more than 1800 petrol stations where B100 could be obtained in 2007, at a distance of 30km from one to the other.[44] There was a substantial increase in the number of bio-petrol stations in Britain too: between 2006 and 2007, the number grew from 110 to 499 stations. The Swedish government decided in April 2006 that all the petrol stations in Sweden – which is considered to be the leading country in Green product use – should offer a variety of bio-petrol products. The deployment of bio-petrol stations in Poland, on the other hand, is not as effective as it is in Western Europe because of the low number of petrol stations relative to the number of cars and because bio-petrol products have

not entered public consciousness due to consumer scepticism as to the quality of the product. At this stage, Poland has a few hundred stations that offer a variety of bio-petrol products, mostly in the Northern parts of the country.[45] The Polish government will therefore have to help establish petrol stations in general and bio-petrol stations in particular in order to raise consumption and strengthen the industry in the coming years.

Conclusion

The bio-petrol industry's contribution to achieving the objectives for which it was established has been very limited. An examination of its objectives shows, first of all, that it was designated to strengthen peripheral areas and to provide support for the agricultural sector. The industry's contribution to diversifying energy sources, on the other hand, has been minimal due to the limited amount of raw material and the influence of oil prices on its profitability. Nonetheless, bio-petrol is a deterring factor against high oil prices and, as technology advances in the coming years, it has the ability of posing more of a challenge to "black gold." From the unemployment point of view, bio-petrol can provide solutions for unemployment, mainly in peripheral areas where there is a high dependence on agriculture. Other than that, countries that invest in developing machinery for the renewable energy industry are likely to be able to offer more jobs in the field in the years to come. And finally, the factors that define the industry are the raw materials a country has, government policy towards the industry, public opinion and pressure groups.

The variety of Poland's raw material, the rising power of social and political organisations linked to the agricultural sector, the expected increase in gas emissions from cars and the decreasing status of peripheral areas, all contribute towards making Poland the country with the greatest potential of all the CEE countries in terms of bio-energy. The lack of effective administration and of government consensus on the need to promote the industry however, will make it difficult for Poland to render its industry appealing and to meet EU targets. It seems that only pressure on the part of the EU, and entrepreneurs from countries like Germany, Denmark and Sweden getting involved in developing the industry, might yield positive

results and bring about a change in government policy with regard to bio-petrol and to bio-energy in general.

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