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Brief Analysis of Biodiesel and Biofuels Production in the Context of Achieving European Energy Policy

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Abstract

Getting energy from alternative sources is for EU Members including Romania, a fundamental objective intended for reducing dependence from traditional energy sources in the context of increasing degree of instability of oil and gas classical suppliers. In this context, the integration into Community Economic Area requires specific objectives in this respect from Romania in order to achieve the 20-20-20 Plan. This paper makes a brief analysis of economic and social implications of bioenergy production, particularly the impact of biodiesel on the European economy in general and particularly on the Romanian one.

Key words: *biofuels, biodiesel, bioethanol, energy policy, European Community space*

JEL Classification: *Q42, Q57*

Introduction

The diversity of approaches concerning the role and the place of renewable energies in the context of ensuring economy, requires analyzing issues from a triple perspective: efficiency (both economic and social and ecological), environmental impact and not least, sustainability. Energy by its nature is a factor in the evolution of any economy, a printing speed of the need to identify new, safe and sustainable sources at the same time. The use of biofuel in the economy shows an accelerating effect of economic activities for developing new technologies through investment, which bring about jobs and budgetary financial resources for sustainable development of the entire economy. The impact on the economy as well as on the environment is significant. The production of biofuels encourages funding of research and development activities, which are capable to bring high benefit to any economy. Although these previously stated effects function as economic multipliers, the issue of biofuels should be understood to its full extent and not just in this context, favorable to those developed economies. The observance of the principles of sustainable human development presumes some approaches oriented towards meeting the needs of a society manifesting continuous diversification of social needs that must be fulfilled. Being in constant need of resources, energy is no exception to the law of scarcity of resources, if it is seen and understood as a resource in a modern sense.

The production of biofuel, biodiesel and bioethanol in particular was developed to reduce dependence on traditional energy sources, with a growing wall of instability. Thus, "*once the oil became the main energy source in the early 20th century, production covered consumption worldwide, regardless of its growth rate. Even during the oil crisis, it was not about chronic*

failure but deliberate reduction of production and limit access to oil. It is true, those moments reminded the world that sooner or later oil will run out, bringing into question the correlation between oil and development."[1]

The development of the alternative energy sources including the diversification of the renewable policy involves building a sustainable, fully geared policy to meet both the requirements and standards of environmental and ecological efficiency, but most importantly, to meet the criteria of social efficiency. Framing energy policy in the production of biodiesel to the general objectives of socio-economic policy must materialize the steps towards the sustainability of production through the reallocation of surplus resources to this area only in terms of ensuring food safety. Therefore, it is considered that "*advertising of the renewable energies is a matter related to the potential of each country. Currently, carbon dioxide emissions in acceding and candidate countries are not considered alarming. Therefore, it should not be considered necessary an aggressive policy to promote the renewable in this group, mainly because investment efforts on upgrading conventional power plants can lead to keeping the same structure of energy production for the next 30 years*[2]". Making a production of biodiesel without taking into account the conditions specific to the national cultural model cannot produce positive effects on the economy but an inefficient relocation of production capital. From this perspective, it is necessary to analyze the effectiveness of adopting these solutions as well as their implications on the environment or cultural model of production structure. The changes in the energetic consumption model that occurred over the years made it more necessary the reorientation of states towards new energy sources that can contribute to reducing dependence on conventional resources. As shown in a document of European Commission "*The EU currently imports 53% of primary energy they consume. Import dependence is 40% for solid fuels, 56% for gas and oil 82% (2005 figures). Baseline Commission updated in 2007 projected for 2030 a total rate of 67% import dependency. Under the second strategic energy review is expected that in 2020 imports of fossil fuels to maintain approximately the current level once the EU policies on climate and energy will be fully implemented"*.[3]

The multitude of steps envisaged to reduce the effects of energy dependence on classical sources led to the development of technologies used in the production of biofuels, their widespread use in transportation by promoting the obligatory 10% share added to the fuel or by classic fiscal measures aimed at exemption from excise on such products.[4] Production of biofuels is considered in close relation to the energy sector. "*However the option for producing biofuels and especially resources used in their production has to be analyzed more in terms of environmental impact and society, rather than in terms of economic efficiency. If to the latter we add effects on the agrifood sector, due to the shift in the energy production, the decision of biofuel production is becoming increasingly difficult to make. So, according to a study by the Joint Research Centre European Commission, concerning the use of biomass in power generation and road fuel: modern biomass energy plants are almost as efficient as plants operating with fossil fuels, so to produce heat and electricity, a megajoule (MJ) of biomass replaced approximately 0.95 MJ of fossil energy. The energy efficiency to convert biomass into*

[1] D o l g h i n , N., *Geopolitica. Dependențele de resursele energetice*, Editura Universității Naționale de Apărare Bucureşti, 2004, p.15

[2] *** Institutul European din Romania, *Despre politica de energie a Uniunii Europene*, Seria Micromonografii - Politici Europene, p.26

[3] *** Comitetul Economic şi Social European, *Dimensiunea externă a politicii energetice a UE*, REX/253, Bruxelles, 16 decembrie 2008, pct.2.3

[4] *** Comisia Europeană, *Propunere de Directiva a Parlamentului European si a Consiliului privind promovarea utilizării energiei din surse regenerabile*, COM (2008) 19 final

liquid fuels for transportation usually ranges from only 30-40%. 1 MJ of biomass replaced as only approximately from 0.35 to 0.45 MJ oil transport"[5].

From this perspective the production of biofuels using biomass is economically inefficient, but its effects on the environment (ecological efficiency) recorded a positive aspect. Placed at the confluence of economic efficiency and environmental effectiveness, biofuels must turn the positive effects to their own advantage. Not always, the analysis in terms of production cost and profit earned should be a priority. Positive effects should be considered as a whole and not just those that express themselves financially. In this context, recorded progress is important in the use of biofuels in the EU 2003-2005 (see Table 1).

Table 1. Progress in the use of biofuels in the Member States

Member state	Biofuel share 2003 (%)	Biofuel share 2004 (%)	Biofuel share 2005 (%)	National indicative target 2005 (%)
Austria	0.06	0.06	0,93	2.50
Belgium	0.00	0.00	0,00	2.00
Czech Republic	1.09	1.00	0.05	3.70
Denmark	0.01	0.03	0.04	0.10
Estonia	0.01	0.12	0.91	2.00
Finland	0.11	0.11	0.09	0.10
France	0.67	0.67	0.97	2.00
Germany	1.21	1.72	3.75	2.00
Hungary	0.05	0.06	0.07	0.60
Italy	0.50	0.50	0.51	1.00
Latvia	0.22	0.07	0.33	2.00
Lithuania	0.00	0.02	0.72	2.00
Poland	0.49	0.30	0.48	0.50
Portugal	0.18	0.91	1.02	2.00
Slovakia	0.14	0.15	0.12	2.00
Slovenia	0.00	0.06	0.35	0.65
Spain	0.35	0.38	0.44	2.00
Sweden	1.32	2.28	2.23	3.00
United Kingdom	0.026	0.04	0.18	0.19
UE25	**0.5%**	**0.7%**	**1.0% (estimate)**	**1.4%**

Source: European Commission progress report on the use of biofuels and other renewable fuels in the EU Member States, COM (2006) 845 final and national reports under the biofuels directive

Promoting biofuels' production and use in the EU economic space was based on a focused policy of increasing substitution of fuel and energy resources generally in the context of reducing dependence on conventional energy resources that are mostly imported from geopolitical areas with high risk of instability. That trend is reflected in the use of biofuels policies and national efforts in the field, but it also draws a Community and national target through a regulatory and legal settlement.

According to data presented in Table 1, if biofuels in 2003 held the 0.5% weighting in use at EU level, two years later, it doubled (1%) due to measures taken within Community space, thus noticing an increase 50% with each year in the period under focus, reaching 1.4% in 2005.

Thus, at the beginning of the interval, biofuel use represented rather the countries' disbelief in promoting them as secure fuel sources and substitutes for classical fuel, the only states that

[5] *** Centrul Comun de Cercetare al Comisiei Europene, *Biofuels in the European Context: Facts, Uncertainties and Recommendations*, 2008, http://ec.europa.eu/dgs/jrc/downloads/jrc_biofuels_report.pdf.

trusted them to a low extent were Czech Republic (1.09%), Sweden (1.32%), France (0.67%), and Italy (0.50%). In this context Germany confirms its status of a country that promotes biofuels (especially biodiesel) as an alternative source or fuel substitution to classical fuel. Thus, Figure 1 presents the evolution of national indicative targets for the share of biofuels, 2006-2010.

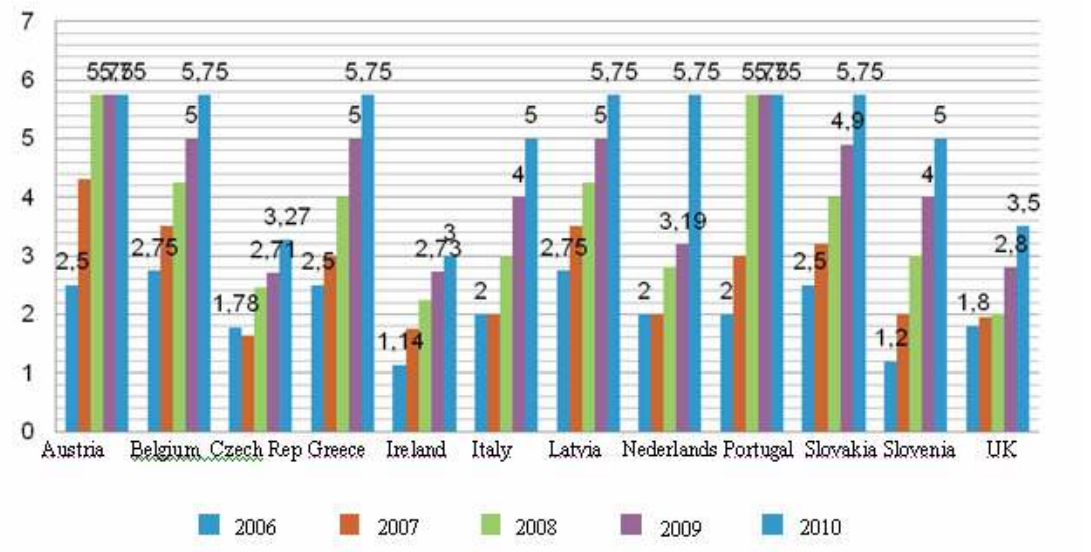

Figure1. Evolution of national indicative targets for biofuel share, 2006-2010

Source: author's own processing based on COM (2006) 845 end database and Eurostat, 2010, available at http://epp.eurostat.ec.europa.eu, accesed on: 02/12/2010

The energy production must have as main source the biomass and its waste, and not energy crops, as the system works now in Romania because they block land resources allocated for food production for humans. Although throughout this period it can be noticed an increase in the production of energy products (energy, heat, fuels) having biomass and waste as raw material, these efforts have not yet reached their potential.

According to the above-presented approach, it is necessary the reorientation of bioenergy production, including biodiesel and bioethanol whose main sources of raw materials used in production are the crops of canola, sunflower for biodiesel or wine and other drinks in the vineyard and winemaking industry to obtain ethanol. The table below presents the evolution of renewable energy production obtained from biomass and waste, in the case of some European countries in 1997-2007.

Table 2. Evolution of biomass renewable energy production and waste in 1997-2007

	1997	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
EU - 27	58998	63069	63379	65641	72577	77692	81858	87936	96179
Belgium	603	671	769	728	959	997	1127	1267	1189
Bulgaria	251	550	547	643	691	737	743	774	711
Czech Rep.	527	444	510	637	1394	1743	1803	1973	2210
Denmark	1575	1687	1822	1917	2144	2253	2318	2396	2549
Germany	5880	6849	7300	7929	9954	11361	13039	15834	22118
Estonia	587	512	551	567	665	678	686	637	735
Ireland	118	141	154	149	144	171	216	217	218
Greece	911	946	970	996	945	954	990	1006	1123

Table 2 (cont.)

Spain	3660	4035	4135	4297	4700	4852	5131	5064	5390
France	11969	12181	11937	11509	12298	12642	12761	12749	13081
Italy	1246	1572	1653	1637	1962	3136	3404	3758	3675
Latvia	1276	1150	1263	1362	1529	1565	1564	1603	1555
Lithuania	516	627	630	666	677	706	734	776	766
Hungary	408	415	387	784	818	860	1118	1245	1288
Austria	2824	3005	3309	3399	3681	3815	3947	4171	4430
Poland	3704	3625	3874	3933	3996	4126	4340	4844	4760
Portugal	2559	2770	2758	2838	2842	2877	2931	3011	3174
Romania	3360	2763	2130	2351	2903	3160	3229	3235	3325
Slovenia	234	458	450	431	460	470	476	462	445
Slovakia	82	100	336	260	331	397	473	501	589
Finland	5698	6474	6298	6789	6979	7364	6878	7651	7353
Sweden	7818	8238	7686	7653	8093	8297	8938	9415	9819
U.K.	1652	2069	2070	2247	2462	2538	2899	3153	3430
Norway	1230	1349	1495	1404	1269	1249	1278	1288	1282

Source: http://epp.eurostat.ec.europa.eu, at 28.02.2010

Bioenergy production obtained from biomass and waste use recorded over the period a significant increase throughout the Community area. If in 1997 this production meant 58.998 thousand tons, ten years later it increased by 60% reaching 96.179 thousand tons. The significant increase for all states listed in the table above is eloquent. The dynamic of this production is related to the technological structure and the use of innovative engineering in producing bioenergy.

As it can be noticed from the data presented in Table 2, in the case of Romania energy production from renewable sources such as biomass and waste has maintained throughout the considered period around the figure of 33,000 tons / year, as compared to that of countries such as Austria or Spain. In this context, "*the need to promote renewable energy in Europe was felt long ago because its large-scale exploitation contributes significantly to slowing down climate change that has increased in recent years due to the fact that emissions of greenhouse gases will be significantly reduced. At the same time the necessity to opt rapidly for renewable energy is necessary in the context of sustainable development, it can help create a society based primarily on knowledge which gives rise to new jobs and contributes to the economic growth focusing on competitiveness and regional and rural development*"[6].

Biodiesel production for developed countries is an alternative to replace traditional energy sources and fuel crises which become manifest in the global energy supply sector, but also to reduce dependence on other countries. In this context, biodiesel can be a competitive substitute for traditional diesel. Table 3 presents the evolution of biodiesel production in some European countries and the world, but also in the U.S. for the period 2000-2008.

[6] Neguț, S., Leca, A., Papatulică, M., Vlad, L.B., Neacşu, M.C., *Orientări privind securitatea energetică a României,* Institutul European din România, Bucuresti, 2008, p.29

Table 3. Developments in production of biodiesel in some European countries during 2000-2008

thousand barrels / day

	2000	2004	2005	2006	2007	2008
USA	-	1.8	5.9	16.3	32	50.46014
Europe	15.3	40.14705	62.22225	98.1463	117.9266	162.8387
Austria	0.4	1.1	1.4	2.4	4.7	7.6082
Belgium	-	-	0.01956	0.48904	3.2	5.65738
Czech Rep.	1.3	1.7	2.5	2.2	1.6	1.50213
Denmark	-	1.3	1.4	1.95616	1.66274	0.7218
France	6.1	6.8	9.6	14.5	19.8	35.40738
Germany	4.3	20.19098	32.64838	52.0731	56.53315	54.99361
Ireland	-	-	0.01956	0.1	0.27386	0.35115
Italy	1.6	6.2	7.7	11.6	9.2	13.07049
Portugal	-	-	0.01956	1.8	3.83408	3.04328
Romania	-	-	-	0.2	0.7	1.6
Slovakia	-	0.2	0.7	0.8	0.9	2.8482
Slovenia	-	-	0.1	0.2	0.1	0.17557
Spain	1.6	2.2	3.2	1.2	3.5211	6.6718
Sweden	-	0.15607	0.15649	0.93896	2.23003	2.82869
U.K.	-	0.2	1.3	3.8	2.9	9.16885
World	15.4	42.84705	74.59641	132.0412	189.413	288.5424

Source: Energy Information Agency, International Energy Statistics database, Renewables, 2010, available at http://www.eia.doe.gov/emeu/international/contents.html at 28.02.2010

As reflected in the table above global biodiesel production is unevenly distributed. It can be observed a production centralization in states with developed economies like Germany, whose production in 2008 (54.99361 thousands barrels / day) is 13 times higher than in 2000, considered as the reference year. For France the situation is somewhat similar, registering a growth of production in 2008 compared to 2000 for seven times. Biodiesel production recorded significant growth in the period analyzed, 2000-2008, for all states listed in Table 3. Compulsory production of biodiesel has operated since 2007 for Romania as well. Contained in European plans to develop biofuels, Romania must develop and produce quantities of biodiesel to the limits imposed by the European documents. This production has not been the result, as in the other countries, of the lack of sources of energy and of the need to find some alternatives to replace the classical fuel, but the effect of the compulsory Community criteria. Over the period 2006-2008, Romania's production increased 8 times, i.e. from 2000 barrels / day in the year 2006 to 1600 barrels per day in 2008. This significant increase led Romania to fit into the general trend traced in the Community space to achieve the 20-20-20 plan, although production is relatively low compared to European production. The general approach to identify new opportunities to replace those fuels with renewable classical ones besides biodiesel, another candidate is the bioethanol, the equivalent of conventional gasoline. Table 4 presents the bioethanol production in some European countries for 2007. The share of this product within the total production of biofuels varies from country to country. Across Europe bioethanol is ¼ of the entire production of biofuels, i.e. 51,300 barrels of total production of 214.2 thousand barrels per day.

Table 4. Structure of bioethanol production in 2007 gross production of biofuels

	Fuel Ethanol	**Total Biofuels**
Europe	51.3	214.2
Austria	0.8	8.5
Belgium	0.2	5.9
Bulgaria	0.0	0.2
Croatia	0.0	0.1
Czech Republic	1.3	2.8
Denmark	0.0	0.7
Finland	0.9	2.5
France	14.4	49.8
Germany	9.9	64.9
Greece	0.0	1.9
Hungary	2.6	5.3
Ireland	0.2	0.5
Italy	1.0	14.1
Norway	0.0	1.0
Poland	3.4	8.4
Portugal	0.0	3.0
Romania	0.0	1.6
Serbia	0.0	1.4
Slovakia	1.6	4.4
Slovenia	0.0	0.2
Spain	5.4	12.1
Sweden	7.2	10.1
Turkey	1.0	1.3
U.K.	1.2	10.4

Source: Energy Information Agency, International Energy Statistics Database, Renewables, 2010, available at: http://www.eia.doe.gov/emeu/international/contents.html, accessed: 02/28/2010

In all European countries that produce ethanol as an alternative source of conventional gasoline, two specific trends can be identified, namely countries that increase the degree of substitution and those that do not produce ethanol. This situation may be due to technology, but especially to the costly production process which prevents this production from meeting the classical criteria of economic efficiency. According to the data presented in Table 4, states such as Croatia, Denmark, Norway, Portugal, Romania, Serbia and Slovenia did not record production of bioethanol in 2007. On the other side, bioethanol production is focused on three European countries, namely Germany (9900 barrels per day out of 64 900 barrels / day), France (14,400 bbl / day of total 49,800 barrels per day) and Spain (5,400 barrels / day of total 12 100 barrels daily). Bioethanol is an opportunity for these countries to deal with the rising fuel prices at classical gas, which changed the direction towards the production of biofuels with almost similar production costs, bringing the break-even production of the latter. According to Renewable Energy Progress Report, the ESC "*Net imports of bioethanol increased from 171 kilotons in 2005 to 397 kilotons in 2007, and the share of domestic production of biodiesel has decreased. In terms of biodiesel, the EU trade balance which was positive in 2005 (355 kilotons exported) was negative in 2007 (1.8 Mt of imported biodiesel). A major cause of this change was the lowest price of soybean oil methyl ester from the U.S. and ethanol produced from sugar cane in Brazil and Argentina."*[7]

[7] *** Comitetul Economic şi Social, *Raportul intermediar privind energia regenerabilă,* TEN/394, Bruxelles, 4 noiembrie 2009, pct. 3.24.

As stated in this document of the European Commission, the effects of biofuel production were generated in the agricultural sector the raw materials being imported from USA, Brazil and Argentina by directing these countries to energy crop production. So it can be observed an intensification of energy production to the detriment of food production, which does not always have a positive impact on the population due to the diminution of its food resources.

Conclusions

Biofuel production brings under analysis all the issues relating not only to environmental effects, but especially to its impact on the agricultural production structure due to the shifting in crops with significant implications for food safety of the population. It therefore requires an analysis of both ecological and especially of social and economic efficiency. It can not be ignored the limited nature of traditional energy resources or of the increase in their degree of substitution with new resources in the context of energy needs diversification.

Biodiesel may become an effective substitute for diesel consumption for those economies that promote new energy technologies, by making massive investments in this sector and thus, also contributing to job growth in this sector. The promotion of biodiesel production must be achieved in the context of wider social efficiency and not only as a result of needs and objectives imposed by political and legal acts.

Achieving such objectives by ignoring the effects on agricultural model, on the standard of living and exaggerating the beneficial effects on the environment will cause serious economic and social imbalances.

References

1. *** Centrul Comun de Cercetare al Comisiei Europene, *Biofuels in the European Context: Facts, Uncertainties and Recommendations*, 2008, http://ec.europa.eu/dgs/jrc/downloads/jrc_biofuels_report.pdf.
2. *** Comitetul Economic şi Social, *Raportul intermediar privind energia regenerabilă,* TEN/394, Bruxelles, 4 noiembrie 2009, pct. 3.24.
3. *** Directorate-General for Research Sustainable Energy Systems, ENERGY. Economic, social and policy-oriented research in Europe, Luxembourg: Office for Official Publications of the European Communities, 2007, available at: http://www.energy.eu/publications/KINA22577ENC_002.pdf.
4. *** Institutul European din Romania, *Despre politica de energie a Uniunii Europene*, Seria Micromonografii - Politici Europene, p.26.
5. Toma, G., *Securitatea națională sub impactul amenințărilor asimetrice*, Editura A.N.I., Bucureşti, 2006.
6. Banse, M., Meijl, H.van, Tabeau, A., Woltjer, G., Will EU Biofuel Policies Affect Global Agricultural Markets?, *European Review of Agricultural Economics*, Vol. 35, No. 2, pp. 117-141, 2008.
7. Dolghin, N., *Geopolitica. Dependențele de resursele energetice*, Editura Universității Naționale de Apărare Bucureşti, 2004, p.15.
8. Done, I., Matei, M., Andrei, J., Some considerations regarding the impact of biofuels on agroalimentar maket, *Buletinul Universității Petrol-Gaze Ploieşti, Seria Stiințe Economice*, 5A/2008, pag 61-68.
9. Done, I., Matei, M., Andrei, J., Ene, C., Stancu, A., *Some disadvantages of biofuels production using agricultural products,* International Scientific Meeting organized by Institute of Agricultural Economics Belgrade, „Multifunctional agricultural and rural development" Serbia, 2008.
10. Gerber, N., Eckert, M., Breuer, T., *The Impacts of Biofuel Production on Food Prices: A Review*, Center for Development Research , GTZ Society for Technical Cooperation, ZEF Discussion Paper No. 127/2009.

11. K e s a n , J. P., O h y a m a , A., *An Economic Evaluation of the Renewable Fuel Standard (RFS) Biofuel Program: An Industrial Policy Approach*, University of Illinois Law & Economics Research Paper No. LE09-035, Illinois Public Law Research Paper No. 09-11/2009.
12. N e g u ț , S., L e c a , A., P a p a t u l i c ă , M., Vlad, L.B., N e a c ş u , M.C., *Orientări privind securitatea energetică a României,* Institutul European din România, Bucureşti, 2008, p.29.
13. P a p a t u l i c ă , M . , *Dimensiunea europeană şi mondială a dezvoltării durabile*, Editura Expert, Bucureşti, 2005.

O scurtă analiză a producției de biodiesel şi biocombustibili în contextul realizării politicii energetice europene

Rezumat

Obținerea de energie din surse alternative constituie pentru statele membre ale UE - inclusiv pentru România - un obiectiv fundamental, menit a asigura reducerea dependenței energetice față de sursele clasice de energie, în contextul creşterii gradului de instabilitate a furnizorilor clasici de petrol şi gaze naturale. În acest context, integrarea în spațiul economic comunitar presupune realizarea obiectivelor comunitare specifice în acest sens din partea României, în vederea atingerii scopurilor Planului 20-20-20. În articol se realizează o scurtă analiză a implicațiilor economice şi sociale ale producției de bioenergie (în special biodiesel) asupra economiei europene în general şi asupra celei autohtone, în special.