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Biofuels Report

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Report Highlights:
Serbia ratified the treaty that established the Energy Community, and is now obliged to implement EU Directives 2001/77/EC and Directive 2003/30/EC. The share of energy from renewable energy resources in Serbia today is about 6 percent. Serbia has great potential in biomass (wood products) and biofuel (Serbia supplies ethanol producers in Italy and Spain). However, due to the lack of proper institutions to introduce renewable energy production incentives, the level of foreign investment in renewable energy production is low. The Government of Serbia hopes that the Energy Community can be an avenue for attracting this needed investment.

Executive Summary:
In 2005, the Republic of Serbia signed and ratified the treaty that established the Energy Community, known as the Energy Community of South East Europe. In conjunction with the Energy Community, in 2009, Serbia adopted its Biomass Action Plan to try to harness its large potential as a biofuels supplier. The Government of Serbia (GOS) drafted the Action Plan in accordance with the Energy Community Treaty and followed EU RED guidelines in anticipation of its passage in the Energy Community. In order to fulfill international obligations and to foster investment in renewable energy sources (RES), starting in 2004, Serbia adopted several new energy related laws and regulations.

In 2010, the Serbian Government adopted its Biomass Action Plan as part of the "Energy Sector Development Strategy of the Republic of Serbia by 2015." The first action plan covers the 2010-2012 timeframe and the second installment will be released this fall. The action plan includes a "to-do list" for the Serbian market in order to harmonize local regulations with EU regulations for renewable energies.

According to Serbia's new Minister of Energy, Zorana Mihajlovic, Serbia will cut excise duties on fuels partly produced with biofuel to stimulate the use of renewable sources and ease price pressures as crude oil costs rise. Fuel produced entirely from biomass is already tax-free, and the GOS plans to reduce the duty for fossil fuels blended with 5-15% biofuels. The tax concession will depend on the percentage of biofuels used in the final product. Even though Serbia has great potential, as exhibited in its biomass action plan and exports of biofuel feedstock, Serbia has never linked its national agricultural policy to directly support the utilization of renewable energy resources. Thus, the level of foreign investments in renewable energy production is low. One of the main reasons is the lack of a proper base line analysis for introducing renewable energy resource production. At the time, the institutions with the ability to handle such an analysis were not fully in place.

The production of energy from renewable resources in Serbia is currently focused only on small projects and pilot facilities. Investment in Serbian renewable energy production capacity is hindered by:

- High borrowing costs;
- Low prices for electricity;
- The lack of profitable feed-in tariffs for electricity from renewables;
- No legal blending requirement;
- The administrative burden of permitting new on-farm installations;
- Issues relating to land title, inheritance rights, and unclear easement boundaries.

Ethanol Production in Serbia between 2006-2011 was almost non-existent. The small amounts of Ethanol produced in 2008, 2009, and 2010 were undenatured and most likely were used in beverages, although accurate data is not available. It is projected that there will be small-scale production at the existing facility as new renewable energy policies come online in the future.

There are no accurate statistics on biodiesel production in Serbia, but the Serbian Ministry of Energy estimates that the consumption of biodiesel accounts for less than 0.5 percent of all diesel consumption in Serbia. Due to the significant potential for production of biodiesel in Serbia, the Ministry estimates that the Serbian transport fuel system could substitute 13-15 percent of its domestic consumption of

diesel (by energy content). The Ministry further estimates that the agricultural sector could substitute roughly 45-50 percent of its total diesel consumption if the GOS introduced preferential tax incentives.

General Information:

Policy and Programs

External Energy Policy

In 2005, the Republic of Serbia signed and ratified the treaty that established the Energy Community, known as the Energy Community of South East Europe. In conjunction with the Energy Community, in 2009, Serbia adopted its Biomass Action Plan to try to harness its large potential as a biofuels supplier. The Government of Serbia (GOS) drafted the Action Plan in accordance with the Energy Community Treaty and followed EU RED guidelines in anticipation of its passage in the Energy Community. In order to fulfill international obligations and to foster investment in renewable energy sources (RES), starting in 2004, Serbia adopted several new energy related laws and regulations.

The Energy Community is an organization tasked with creating investments, economic development, security of energy supply and social stability in the South East European region. There are 25 countries that participate in the Energy Community and 4 observers who do not have voting rights. Of the 25 participants in the Community, ten are listed as "parties": Albania, Bosnia and Herzegovina, Croatia, the European Union, the Former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia, Ukraine, and the United Nations Interim Administration Mission in Kosovo (UNMIK). This structure allows the European Union to offer contracts on the one hand and have the other nine party members as contractors on the other hand. The other 15 participants are all EU Member States that offer technical and financial support.

Treaty ratification by the nine contracting parties commits them to adopting the *Acquis Communautaire*, which includes the EU renewable energy directives, along negotiated timelines. This has benefits for both the contracting parties, who receive technical and financial support, but also for the EU as it expands the reach of its energy policy and reduces the costs of trading energy and feedstock with non-EU members. The final group within the Energy Community is donors, which include several development organizations such as the United States Agency for International Development (USAID).

On October 18, 2012, Energy Community participants plan to meet and vote on the official acceptance of the EU RED as the new guiding document for renewable energies within the contracting parties. As the RED repealed the two previous guiding documents, Directive 2001/77/EC and Directive 2003/30/EC, the vote is likely a foregone conclusion. However, the sustainability provisions within the RED do concern some Community parties. It is unclear how Serbia is expected to vote, but as an EU Member State candidate, Serbia would be required to adopt the RED sustainability criteria during EU accession if it did not adopt the provisions through the Energy Community.

In 2009, Serbia adopted its Biomass Action Plan. Serbia drafted the plan in accordance with the Energy Community Treaty and following EU RED guidelines. Serbia has significant biomass potential as round wood use accounts for 63 percent of total renewable energy use in Serbia and forests cover about 30 percent of the territory. In addition, 55% of its land is arable. As part of its Energy Community commitment, the Ministry of Agriculture, Forestry, and Water Management developed a biomass

potential study. The final data is presented in the statistical notes section of this report, but it shows the potential for Serbia to be a major supplier of biomass to the EU and a contributor to the success or failure of the RED.

Internal Energy Policy

In order to fulfill international obligations and to foster investment in renewable energy sources (RES), Serbia adopted several energy related laws and regulations. Including:

• The Energy Law ("Official Gazette RS" 57/2011), that provides the overall foundation for development of renewable energy sources and energy efficiency;

• The Energy Sector Development Strategy of Republic of Serbia by 2015 ("Official Gazette RS" 44/2005), that emphasizes the importance of utilization of renewable energy sources for distributed heat and power generation and recognizes the Serbian Energy Efficiency Agency, Energy Efficiency Fund and introduction of support schemes;

• The Decree on the Requirements for obtaining the Status of the Privileged Power Producer and the Criteria for Assessing Fulfillment of these Requirements ("Official Gazette RS"72/2009);

• The Decree on incentive measures for electricity generation using renewable energy sources and combined heat and power (CHP) generation ("Official Gazette RS" 99/2009), that defines feed-in tariffs for renewable electricity;

• The Regulation on technical and other requirements of liquid biofuels ("Official Gazette SM" 23/06), that defines the technical requirements for biodiesel, Ethanol and other biofuels;

• The Construction Law ("Official Gazette RS"72/2009), that defines the procedure for obtaining construction permit and includes regulations on boilers with RES;

• Law on Environmental Protection ("Official Gazette RS"72/2009);

• Law on Strategic Environmental Assessment ("Official Gazette RS"135/2004);

• Law on Environmental Impact Assessment ("Official Gazette RS" 36/2009);

• Integrated Pollution Prevention and Control Law ("Official Gazette RS" 135/2004);

• The Law on Waste Management ("Official Gazette RS" 36/2009), that defines the use of residue materials for the production of biogas and biodiesel;

• Law on Air Quality ("Official Gazette RS" 36/2009), that defines the limits of emissions for facilities that use biomass as a fuel;

• Law on ratification of Kyoto Protocol ("Official Gazette RS" 88/2007 and 38/2009);

• National Strategy for Sustainable Development ("Official Gazette RS" 57/2008);

• Strategy of Implementation of Clean Production in Republic of Serbia ("Official Gazette RS" 17/2009).

In 2002, Serbia introduced the National Program of Energy Efficiency. This program was the first one that incorporated the utilization of renewable energy. Through this program, several pilot projects and research studies were conducted for use of renewable and alternative energy resources. Through the process of harmonizing Serbia's national legislation with the EU requirements, the Ministry of Mining and Energy of the Republic of Serbia prepared a reform of the energy sector. This reform established a new legal, institutional, and regulatory framework in order to create a more efficient energy market and spur investment. The main priorities of the reform were modernization of existing power plants, rational utilization of fossil fuel sources, utilization of renewable energy sources, and implementation of clean technologies and construction of new power plants. The implementation of the Kyoto Protocol also was adopted as a useful tool in order to achieve European standards on environmental protection.

The basic legal framework relevant for the power sector as a whole in Serbia was incorporated in the Energy Law adopted in 2004. The law covers the generation, transmission, distribution, and supply of electricity. This is accomplished through the establishment and operations guidelines of the Serbian Energy Regulatory Agency (AERS), the organization of the electricity market, and the transportation, distribution, storage, trade and supply of oil products and natural gas and the production and distribution of community heat for household and industrial use.

In July 2011, Serbia adopted an amended Energy Law that further imposed important changes in the market by harmonizing the Serbian Energy Law with the EU *Acquis Communautaire*. Changes in the new Energy Law included, market definition and liberalization of the energy market, separation of competitive and regulated activities in the field of electricity, access to cross-border transmission capacities, introduction of incentives for new investments in the energy sector, and more detailed conditions for the use of renewable energy sources (RES). The goal of the new Energy Law is to contribute to a safe and reliable supply of energy to Serbia, provide less dependence on imports, and turn Serbia into an energy exporter.

In 2010, as part of Energy Sector Development Strategy of Republic of Serbia by 2015, the Serbian Government adopted the Biomass Action Plan for Serbia. The first action plan covers the 2010-2012 timeframe and the second installment will be released in the fall. The action plan includes a "to-do list" for the Serbian market in order to harmonize local regulations with EU regulations for renewable energies. The list includes: better interpretation of relevant terms and definitions; harmonization of waste processing levels; harmonization and integration of waste policy; regulations within other areas of policy (like construction and permitting); and, cooperation with national and international biomass associations.

Serbia has great biomass and biofuel potential as it has some of the largest areas of agricultural and forested lands in Europe. However, Serbia has never linked its national agricultural policy to directly supporting utilization of renewable energy resources. One of the main reasons was the lack of a proper base line analysis and a plan for introducing renewable energy resource production. In addition, the institutions to handle such a program were not fully in place. The Government of Serbia (GOS) sees establishing the proper institutions as a precondition for sustainable subsidy measures. Based on recent

announcements, it is hoped that upcoming changes in Serbian Agriculture Policy will increase the capacity for RES production and show how important renewable energy production can be to rural and agricultural development.

The level of foreign investment in renewable energy production facilities in Serbia is low. This is similar to other non-EU and EU Balkan states. Investors are awaiting the outcome of the RED policy debate and a clear indication of the policy direction. However, foreign investors have expressed an interest in Serbia, as input costs are low and transportation to the EU is readily available. The level of interest and foreign investment will likely depend on the institutional and legal reforms carried out by the GOS, such as incentives and less complex administrative procedures for the construction of new facilities.

The production of energy from renewable resources in Serbia is currently focused only on small projects and pilot facilities. Investment in Serbian renewable energy production capacity is hindered by:

- High borrowing costs;
- Low prices for electricity;
- The lack of profitable feed-in tariffs for electricity made from renewables;
- No legal blending requirement;
- The administrative burden of permitting new on-farm installations;
- Issues relating to land title, inheritance rights, and unclear easement boundaries.

The absence of support mechanism and high interest rates are a significant obstacle to providing funds for construction of on-farm installations and modernizing agricultural practices with new technologies. The average interest rates for business in Serbia are between 12-16 percent annually, and without clear property rights or crop-loss insurance, the individual farmer may not be able to get a competitive loan. Given the above-mentioned obstacles, it is clear why incentives will play a significant role in encouraging the installation of facilities for production of renewable energy. The legal regulations to obtain the status of privileged producer (producer of renewable energy resources) have yet to be completed. In addition, there is no support to cover delivering the electricity to the grid - the producer must pay to connect the plant to the grid. These charges can be significant, and can make a project uneconomical. Although the electric company is obliged to buy electricity produced from renewable resources, only a few practical steps were taken to encourage the production and connection to the grid.

According to Serbia's new Minister of Energy, Zorana Mihajlovic, Serbia will cut excise duties on fuels partly produced with biofuel to stimulate the use of renewable sources and ease price pressures as crude oil costs rise. Fuel produced entirely from biomass is already tax-free, and the GOS plans to reduce the duty for fossil fuels blended with 5-15% biofuels. The tax concession will depend on the percentage of biofuels used in the final product.

Ethanol and Biodiesel

Ethanol

In Serbia, production of energy from agriculture is still in the pilot phase and there is no detailed analysis on the topic. Currently, farmers are just starting to become aware of renewable energy's potential, so only a small number are interested in further involvement in renewable energy production. If proposed

incentives do become reality, the number of farmers planting crops and signing contracts with domestic and foreign renewable fuel companies would likely grow rapidly.

Ethanol Production in Serbia between 2006-2011 was almost non-existent. The small amounts of Ethanol produced in 2008, 2009, and 2010 were undenatured and most likely were used in beverages, although accurate data is not available. It is projected that there will be small-scale production at the existing facility as new renewable energy policies come online in the future.

Fuel Ethanol - Conventional & Advanced Fuels (Mil. Liters)								
Calendar Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Production, Total	0.00	0.03	0.08	0.22	0.45	0.00	0.00	0.25
Advanced Only	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Imports	0.00	0.06	0.01	0.01	0.01	0.02	0.01	0.01
Exports	0.00	0.03	0.08	0.22	0.45	0.00	0.00	0.25
Consumption	0.00	0.06	0.01	0.01	0.01	0.02	0.01	0.01
Ending Stocks	0	0	0	0	0	0	0	0
Production Capacity – Conventional								
No. of Biorefineries	-	-	-	-	-	-	-	-
Capacity (Mil. Liters)	-	-	-	-	-	-	-	-
Capacity Use (%)	-	-	-	-	-	-	-	-
Production Capacity – Advanced								
No. of Biorefineries	0	1	1	1	1	1	1	1
Capacity (Mil. Liters)	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Capacity Use (%)	0%	0%	0%	0%	0%	0%	0%	0%
Co-product Production - Conventional only (1,000 MT)								
Corn	0	0	0	0	0	0	0	0
Feedstock Use - Conventional (1,000 MT)								
Corn	0	0	0	1	1	0	0	1
Feedstock B								
Feedstock C								
Feedstock D								
Feedstock Use - Advanced (1,000 MT)								
Feedstock A								
Feedstock B								
Feedstock C								
Feedstock D								

Source: First-Hand Interviews and Statistics Serbia and Montenegro,
Statistical Office of the Republic of Serbia

There is no data source available to differentiate between fuel, beverage, and industrial ethanol use.

Serbia as a Feedstock Supplier

In interviews and discussions with Serbian and EU based traders and biofuel producers, FAS/Belgrade staff learned that Spanish, Italian, and Austrian ethanol producers use a significant proportion of the exported Serbian corn. The exact amount or percentage is uncertain at this time due to a lack of reliable data. However, as can be seen in the table below, over 81 percent of Serbian corn exports end up in the EU. The large amount of shipments to Romania in the table below represents the difficulty in tracking grain shipments to their final destinations. Much of the grain labeled as an export to Romania continues on to other destinations through the Black Sea port of Constanta. From there, grain traders mix the Serbian grain and ship it to destinations throughout the EU. As a percentage of EU imports, Serbia accounted for over 13 percent of all shipments to the EU in 2011. This number is lower than the actual number as it does not take into account the amount of Serbian corn that is re-exported from Romania. Despite the loss of Romanian re-exports, Serbia ranked as the third largest supplier to the EU.

Serbian Corn Exports								
Corn – HS Code 100590								
Calendar Year: 2009 – 2011								
Partner Country	**Unit**	**Quantity**			**% Share**			**% Change**
		2009	**2010**	**2011**	**2009**	**2010**	**2011**	**2011/2010**
World	T	1591061	1653356	1621647	100.00	100.00	100.00	- 1.92
EU27	T	1339273	1387363	1315099	84.17	83.91	81.10	- 5.21
Romania	T	1111412	1046435	1061457	69.85	63.29	65.46	1.44
Bosnia & Herzegovina	T	131206	150375	157575	8.25	9.10	9.72	4.79
Italy	T	49261	69563	122747	3.10	4.21	7.57	76.45
Macedonia	T	49144	45273	58503	3.09	2.74	3.61	29.22
Croatia	T	2992	768	36933	0.19	0.05	2.28	4709.43

Source: First-Hand Interviews and Statistics Serbia and Montenegro, Statistical Office of the Republic of Serbia

Biodiesel

Serbian biodiesel production has seen three distinct periods:

1) The first period starts in the 1980s, when investments were introduced as a result of research achievements, introduction of modern technologies (at that time), and introduction of support measures to add value to agricultural products. At that time, Serbian companies introduced the production of biogas and combustion of biomass.
2) The second period links to the period of sanctions. During the 1990s, when Serbia could not import oil, the government turned to the production of biofuels as a strategic task to help provide stability and maintain core functions of the central government. During this period, Serbia produced biodiesel and

ethanol in large quantities. Data is difficult to produce, but anecdotally, Serbia's blend levels of biofuels were some of the highest in the world as almost all agricultural machinery ran on biodiesel with high blend levels, as fossil fuels were a scarce commodity.

3) The third period starts after the sanctions lifted, roughly 2001, until today. Serbia has signed several international treaties relating to biofuel and biomass use, and as an EU candidate is in the process of harmonizing its regulations with the EU. In addition, new technologies that have lower input costs are readily available and the production and acceptance of biofuels is rising from test batches today, to the recent announcement by EuroLux Petrol (ELP) of the introduction of biodiesel at 10 retail gas stations. This biodiesel is imported, and sells for roughly 20 Dinar (5 cents) per liter less than non-biodiesel, as Serbia has no excise taxes on the blended portion of biodiesel.

There are no accurate statistics on biodiesel production in Serbia, but the Serbian Ministry of Energy estimates that the consumption of biodiesel accounts for less than 0.5 percent of all diesel consumption in Serbia. Due to the significant potential for production of biodiesel in Serbia, the Ministry estimates that the Serbian transport fuel system could substitute 13-15 percent of its domestic consumption of diesel (by energy content). The Ministry further estimates that the agricultural sector could substitute roughly 45-50 percent of its total diesel consumption if the GOS introduced preferential tax incentives.

Biodiesel - Conventional & Advanced Fuels (Mil. Liters)								
Calendar Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Production, Total	28.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Advanced Only	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Imports	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05
Exports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumption	28.40	0.00	0.00	0.00	0.00	0.00	0.03	0.05
Ending Stocks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Production Capacity - Conventional								
No. of Biorefineries	1	1	1	1	1	1	1	1
Capacity (Mil. Liters)	114	114	114	114	114	114	114	114
Capacity Use (%)	25%	0%	0%	0%	0%	0%	0%	0%
Production Capacity - Advanced								
No. of Biorefineries	0	0	0	0	0	0	0	0
Capacity (Mil. Liters)	0	0	0	0	0	0	0	0
Capacity Use (%)	0%	0%	0%	0%	0%	0%	0%	0%
Feedstock Use - Conventional (1,000 MT)								
Rape Seed	1,000.0	0	0	0	0	0	0	0
Feedstock Use - Advanced (1,000 MT)								

Source: First-Hand Interviews and Statistics Serbia and Montenegro, Statistical Office of the Republic of Serbia

PSD for Rape Seed and Rape Seed Oil in Serbia

Rape Seed/Rape Seed Oil	**MY2009/10**	**MY2010/11**	**MY2011/12**

Area planted with rape seed (HA)	18,091	12,012	15,357
Average yield (MT/HA)	2.45	2.03	2.9
Production of rape seed (MT)	44,300	24,399	44,531
Imports (MT)	8,960	4,946	11,028
Exports (MT)	8,154	2,377	14,440
Production of rape seed oil (MT)	19,847	11,866	18,092
Imports (MT)	443	555	520
Exports (MT)	19,186	6,685	11,750

Rapeseed exports mainly go to Germany, Austria, Spain, and Italy.

Advanced Biofuels

Other Renewable and Biomass for Heat and Power

Hydropower

Today in Serbia, the share of energy from renewable energy resources is about 6 percent (including hydro-power) and it is predicted that it will not change much until 2015. Serbia is in the process of creating its next Energy Sector Development Strategy for submission to the Energy Community secretariat. This document will guide the share of renewable energy in the total consumption of energy until 2018. The current National Energy Sector Development Strategy for 2015 calls for the development of 150 new small hydropower plants providing 100 MW, and 4,000 new small boilers to use biomass from industrial, agricultural and forest residues.

Biogas digesters in Serbia:

A biogas digester is currently operational only in the dairy production company "Lazar" Blace in South Serbia. However, two other biogas digesters will come online soon in the milk production farms "Sava Kovacevic" Vrbas and "Velvet Farm" Curug, both located in Vojvodina.

National Electro Company is not keen to support potential competitors, no matter how small they are. In addition, the guaranteed price for energy produced from renewable resources has been too small to make these small producers of electricity competitive. Regional distributors of electric energy do not have the technical capacity to organize a complex gird that includes a larger number of small producers.

The only investments in Renewable Energy Sources in Serbia are small hydro plants that produce symbolic amounts of energy (1.6 percent of total electricity production), several isolated attempts of getting the energy from waste, wind, geothermal and other sources, and one large business venture in first generation bio-fuels ("Victoria Oil", supported by EBRD loan of EUR 25 million). In 2007, Serbian leading agribusiness company "Victoria Group" opened a new factory for biodiesel production in Sid, which fulfils the requirements of the standard EN 14214. The year the factory opened, it produced around 25,000 tons of biodiesel. Its installed annual capacity is 100.000 tons. In 2007, the factory signed annual contracts with rapeseed farmers. The factory provided expertise, seeds, fertilizers, and other chemical inputs, biodiesel fuel for planting and growing the crop. They set a fixed price for the purchase of the crop, based on a calculation of the provided inputs. The interest among the farmers was quite strong and rapeseed production increased drastically that year. However, due to the lack of any

government incentives for biodiesel production and the high excise tax that made biodiesel production unprofitable, the “Victoria Group” soon stopped producing biodiesel and switched to edible oils.

Since 2006, “Victoria Group” has also been developing a system of biomass boilers that operate on straws pellets and sunflower oil by-products. The “Victoria Group” located these biomass boilers (Belgium technology) in several production facilities. The company plan is that 80 percent of the total energy used by the “Victoria Group” will come from a renewable source.

Notes on Statistical Data

1.Biomass from grain and industrial crops for Republic of Serbia											
Crop	Sown area (ha)	Average yield (t/ha)	Ratio of grain / biomass	Total biomass (t)	Price of biomass (EUR/t)	Heating value MJ/t	Annual available energy (MJ)	Annual possibility of substitution of diesel fuel (t)	Price of diesel fuel for the substitution of (EUR) (Diesel 0,93 EUR/kg)	The possibility of savings with 25% utilization of biomass (EUR)	TOE
Corn	1277000	5	(z:b) 1 / 1	6768100	38	13500	91369350000	167139	1554393210	388598303	16368118
Wheat	566000	3	(z:b) 1 / 1	1867800	32	14000	26149200000	478339	4448505293	111213823	46844445
Barley	70000	3	(z:b) 1 / 1	227516	32	14200	32307300542	59099	5496818	13740455	57876
Rye	5000	3	(z:b) 1 / 2	26724	32	14000	374137809	6844	6364905	1591226	6702
Oat	12000	2	(z:b) 1 / 1	27952	32	14500	405303922	7414	6895109	1723777	7261
Triticale	45000	4	(z:b) 1 / 1	190951	32	14000	2673315766	48902	4547896	11369742	47891
Soya	144	2	(z:b	6969	32	157	109422	2001	18615	4653	196

	000		) 1 / 2	60		00	72000	64	2066	8017	023
Sunflower	198000	2	(z:b) 1 / 2	942480	35	14500	13665960000	249987	2324879978	58121995	244816
Oil rape seed	6000	2	(z:b) 1 / 2	25135	32	17400	437351209	8000	7440304	1860076	7835
Sugar beet	65000	47	(z:b) 1 / 0,4	3066700			0	0	0	0	0
TOTAL	32756			13840319			149247621248	2730139	2539029654	634757414	2673666

2. Biomass from Orchards and Vineyards in the Republic of Serbia										
Fruit and vines	Number of trees (kom)	The average fruit yield (kg/tree)	Total fruit yield (t)	The rest of the biomass of pruning* (t)	Heating value of biomass (MJ/t)	Annual available energy (MJ)	Annual possibility of substitution of diesel fuel (t)	Price of diesel fuel for the substitution (EUR) (Disel 0,93 EUR/kg)	The possibility of savings of 80% utilization of biomass (EUR)	TOE
Apple	15880000	11.3	179444.00	58319.30	15300	89228529 0.00	16322.29	15179731.46	12143785.17	15984.66
Pear	4414000	11.3	49878.20	16210.42	15300	24801934 9.50	4536.94	4219353.57	3375482.85	4443.09
Apricot	1696000	18.1	30697.60	9976.72	15800	15763217 6.00	2883.52	2681669.34	2145335.47	2823.87
Cherry	8377000	14.3	119791.10	38932.11	15900	61902050 9.25	11323.55	1053089 7.69	8424718.15	11089.32
Peach	4516000	11.4	51482.40	16731.78	15800	26436212 4.00	4835.89	4497380.04	3597904.03	4735.86
Plum	41171000	19.5	802834.50	260921.21	15800	41225551 57.5	75412.59	7013371 2.74	5610697 0.19	73852.68
Nut	1735000	15.9	27586.50	8965.61	16500	14793260 6.25	2706.08	2516658.36	2013326.69	2650.11
Vin	2373	1.5	35605.	16271	140	227801	4167.0	387539	310031	4080.

e	6700		05	.51	00	109.90	9	6.93	7.54	90
TOTAL			12973 19.35	42632 8.66		667960 8322.4	12218 7.96	113634 800.12	909078 40.10	11966 0.49
			* In fruit ratio of the weight and pruned biomass is 1:0,325							
			* In vine fruit weight ratio and pruned biomass is 1:0,457							

3. The energy potential of manure in Republic of Serbia										
Live stock	Number of livestock (10^3 unit)	Number of animals in conditional heads (unit)	Number of conditional heads (kom)	Biogas per day (Nm^3 /UG)	Biogas available for 365 days (Nm^3)	Annual available energy (MJ)	Annual possibility of substitution of diesel fuel (t)	Price of diesel fuel for the substitution of (EUR) (Diesel 0.93 EUR / kg)	The possibility of savings with 80% efficiency (EUR)	TOE
Cattle	1001458	1.2	834548.33	1.3	395993184.17	9369198737	205665.34	191268764.47	153015011.57	201411.14
Pigs	3164594	6	527432.33	1.5	288769202.50	6832279331	149976.86	139478482.93	111582786.34	146874.59
Poultry	30000000	300	100000.00	2	73000000.00	1727180000.00	37913.71	35259747.80	28207798.24	37129.46
Total			1461980.67	4.80	757762386.67	17928658068.53	393555.91	366006995.20	292805596.16	385,415.19
Calorific value of biogas with 65% methane - hd = 23.66 MJ/Nm^3 or 35.8 MJ / kg										