

STUDIES REGARDING THE DIVISION IN ROMANIA OF AGRICULTURAL CROPS – RAW MATERIAL FOR BIODIESEL PRODUCTION

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Abstract

According to Directive 2003/30/EC of the European Parliament and of the Council regarding the promotion and use of biofuels for transport, Romania is using biodiesel blended with conventional diesel in amount of 4% from 1 July 2008 and in amount of 5 % from 1 January 2011.

The main advantages of biodiesel compared to conventional diesel are linked on one hand, to the environmental protection against pollution and on the other hand the annual regeneration of oil crops that can be raw material for biodiesel. There are large areas in Romania with favorable pedo-climatic conditions for the cultivation of these oil crops, the most important being rapeseed, soybean and sunflower. These species have the advantage that they can be fully mechanized thus reducing costs with labor force. Also the introduction of varieties with high production efficiency rises the productivity of these species.

Given these considerations, the areas for growing the biodiesel production crops gain an increasing proportion within Romania's arable territory.

Key words: Oilseed crops, biodiesel.

The amount of biomass formed by the plants on the entire planet is significant and substantially exceeds the energy needs of mankind. From this entire amount, most cannot be exploited for energy purposes for population due to technical, economical and ecological reasons. However, there remains a large quantity available for exploitation.

Biomass includes, among others, energy resources derived from a wide range of agricultural and forestry products such as wood, agricultural and technical plants grown specifically to be used as energy sources, agricultural and forestry residues, also waste from forestry and agriculture and from households and farms. Biomass contains stored chemical energy, derived from solar energy. Biomass consists mainly of live and dead plants, which used the process of photosynthesis to store solar energy in the form of chemical compounds that constitute the plant itself, or reserve stored in the seed required for germination.

According to the European Environment Agency (EEA) biomass utilization for unconventional fuels has a high potential for growth in the European Union following the next years, without harming biodiversity, soil and water resources. The potential of biomass available at European level is sufficient to satisfy the directives that require the gradual replacement of fossil fuels with those coming from renewable sources. Being made from agricultural residues, forestry and

organic, biomass can produce heat, energy and transport fuels without affecting the environment.

This is possible because all the plants while growing, naturally balance most of the carbon dioxide of the fuel when the fuel is combusted, eliminating a major contributing factor to global warming.

MATERIAL AND METHOD

The studies were conducted during 2010, using as sources of information literature in Romania and foreign sources.

Also for the paper elaboration there were used the available statistical yearbooks and national statistical data regarding the production of crops for biofuels, especially biodiesel. There were consulted the results of the reports made by international institutions in charge with supervising the production development of raw material for biofuels and also the actual level of biofuels production, especially biodiesel. Data from literature was statistically processed and interpreted so as to highlight the most relevant opportunities for biodiesel.

RESULTS AND DISCUSSIONS

Biodiesel belongs to the first generation of biofuels from the four generations for which it has been made a production technology so far.

The European Union and also Romania is currently producing biofuels of the first generation, biodiesel and bioethanol.

These biofuels are obtained from biomass in the form of oilseed plants, that is rapeseed, sunflower or soybean oil for biodiesel, and corn or sugar beet for bioethanol.

Biodiesel has emerged as a necessity to use raw materials in order to optimize efficiency and independence regarding energy. The requirement for vegetable oil conversion to biodiesel is due to the changes of engine attributes from one generation to another, since the invention of diesel engine to present. The drawback using unprocessed vegetable oil in modern diesel engines is due to the oil high degree of viscosity compared to diesel obtained from fossil sources. Modern engines were optimized over time to run on conventional diesel which has low viscosity, and cannot run on a high viscosity fluid similar to oil.

Among the crops that can be raw material for biodiesel, the largest share is held by the rapeseed crop, both in Romania and Europe. Rapeseed crop is the crop with the best yield, which is why in the European Union, rapeseed oil is about 40% of the total production of biodiesel. In contrast, soybean oil is used in a mixture of 30-40% and in addition, for this culture iodine is a limiting factor. Sunflower is also a plant that can be used to produce biodiesel and unlike the other has a high content of oleic acid.

Much larger areas allocated for sunflower crop can be explained by the wider use of this crop, especially for human consumption. Sunflower provides raw material for vegetable oil and its derivatives for human consumption. Thus, in Romania, rapeseed crop remains the main raw material for biodiesel production.

According to Ministry of Agriculture and Rural Development, most favorable areas for rapeseed cultivation include the west and east region of the country (Campia de Vest / Western Plain, Podisul Moldovei / Plateau of Moldavia), Plateau of Transylvania which are appropriate by their particular soil and climatic optimal conditions for emergence and hibernation of the plants without loss. On the other hand, the favorable zones for rapeseed cultivation is the southern region (Campia Romana / Romanian Plain), but only under irrigation, in order to ensure an uniform and rapid emergence for hibernation.

In figure 1 there are the areas assigned to rapeseed and sunflower crops, by development regions.

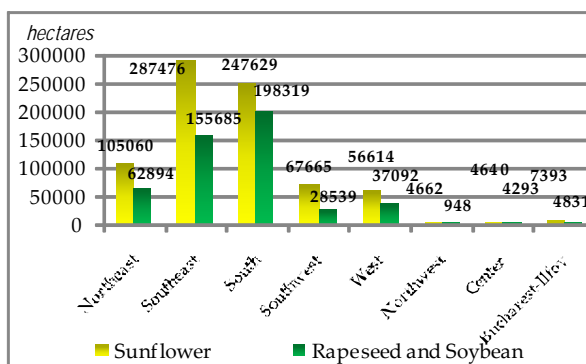


Figure 1 Areas allocated to energy crops in 2007

We can observe that in 2007 the largest areas of planted sunflower, rapeseed and soybean crops were in the regions of South, Southeast and Northeast. On the one hand, the South East region, which includes the counties of Braila, Buzau, Constanta, Galati, Tulcea and Vrancea the landforms are mostly uniform and generally suitable for field crops and especially for energy crops. On the other hand, the same situation is found in the south, where the landform is characterized by uniformity and it is suitable for these crops.

In contrast, in the North-East region the landform is uneven, three of the counties, Bacau, Suceava and Neamt having mountain in their landform. Plateau landform, named Podisul Moldovei / Moldova Plateau is present in all six counties.

Botosani, Iasi and Vaslui counties comprise predominantly plains belonging to Campia Moldovei / Moldavian Plain and Lunca Prutului / Prut Meadow. Due to this factor, these three counties are most suitable for field crops and especially for energy crops.

In the following figure (fig.2) it is highlighted this issue, the areas assigned to oilseed crops in the Northeast region being outlined by county.

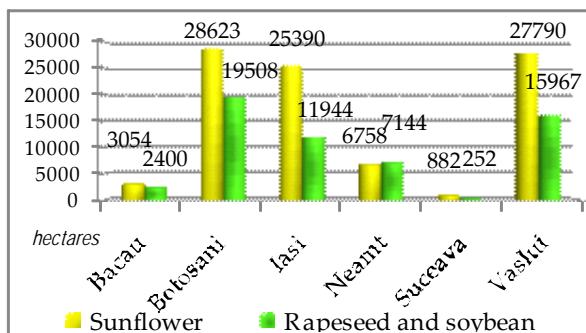


Figure 2 Areas assigned to energy crops in the Northeast region in 2008

It can be seen as the largest areas for oilseed crops from which biodiesel can be produced, are in Botosani county, followed by counties Vaslui and Iasi.

In recent years, the areas assigned to these crops grew rapidly, due to the increasing demand in the national and international markets for vegetable oil as the main raw material for biodiesel production. In 2001, from the country's arable land around only 82,400 hectares were planted with rape (*tab. 1*) whereas for the year 2009 the area has increased more than five times, to an area of 419,900 hectares.

Average production per hectare had different swings over recent years (*table 1*) due to climate phenomena. However, the tendency consists in increasing the production per hectare, due to improvement of cultivated varieties and their optimization for levels of production as high as possible given the soil and climate conditions in the growing areas.

Data regarding dynamics of planted area, production, market prices and trade balance for the rapeseed crop											
Description	UM	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Area	thousand hectares	82.4	74.6	17.1	49.7	87.8	110.1	364.9	365	419.9	579.5
Average production	kg / ha	1,235	481	473	1,984	1,681	1,590	991	1,844	1,357	1,589
Total Production	mii to	101.8	35.9	8.1	98.7	147.6	175.1	361.5	673	569.6	920.6
Price / kg	Lei					0.6	0.4	0.79	1.20	0.97	1.1
Balance of trade	thousand E							69,818	210,219	195,545.	5.076

It can be observed, as after 2007 when production was low of less than 1000 kg / ha, year 2008 had a very high production, of over 1900 kg of rapeseed per hectare. In 2008 the market price was among the highest in recent years of 1.2 lei/kg.

Although in recent years there was a high biodiesel quantity imported instead of being produced locally, the balance of trade regarding rapeseed was positive, with a substantially higher export than import. The difference between exports and imports of rapeseed in 2008 was over 210 million Euros. The net export quantity consisted in 487,668 tons.

Rapeseed crop represents a special case at present in Romania. It seen an extreme rise in recent years by size of land cultivated, because the development and use on a large scale of biodiesel blended with conventional diesel. On the one hand, many foreign investors, with intentions to set up large biodiesel plants have started to cultivate large areas of rape to provide feedstock for these plants. Most have proceeded to rape cultivation even before beginning construction of factories, given a series of predictions on the production capacity and the need for these units of raw material in order to produce biodiesel. Also, they had in mind the extent of the campaigns for specific agricultural crops. On the other hand, many small producers have included rape among their crops based on the forecast that the price and demand will rise in relation to other crops, given the emergence of these structures for the production of biodiesel.

Unlike the rapeseed crop, soybean crop is used mainly in obtaining animal feed or by

processing in food industry. It occupies smaller areas than other oil plants (*fig. 3*) because de agricultural products obtained from soybean can be replaced by products made from sunflower and rapeseed crops.

The dimensions of the areas planted with various crops suffer annual changes depending on a variety of criteria. Compatibility is the main issue, because some cultures cannot follow other cultures on the same area of land given the conformation and the resources they require. On the other hand, farmers are growing varieties based by the final price they will get for the production, researching the market and predicting the next year price when they will obtain the agricultural products.

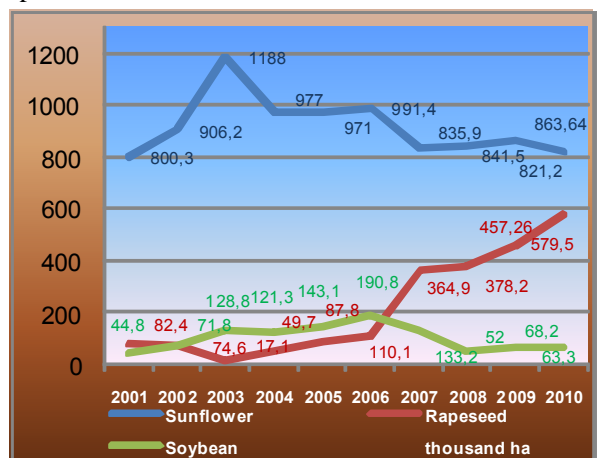


Figure 3 Surfaces planted with energy crops between 2001 and 2010

We can observe, that after a certain balance between area sizes planted with rapeseed and soybean, in 2003-2006, the ratio has changed over soybean crop due to the ban cultivation of

genetically modified varieties. Since 2003, due to the numerous founding initiatives at national and European level, the need for raw materials increased the area planted with rape, so since 2006, the ratio became favorable to rape, generated also by the cultivation ban in Romania (since 2007 - when it was admitted to the EU) of genetically modified soybean varieties.

For the year 2010, the total area assigned rapeseed cultivation has increased more pronounced, due to higher selling prices, both on domestic and international markets.

The ratio of rapeseed and soybeans favorable for soybean crop until 2006 is explained by the fact that in 2006, Romania was still negotiating its integration into the European Union without the obligation to comply with its directive related to plant varieties genetically modified. Starting January 1, 2007, when it was admitted to the European Union, the areas for the cultivation of soybeans fell substantially, given the European regulations prohibiting the cultivation of genetically modified plants.

Regarding the rapeseed crop, it is expected a continuous increase each year of the areas planted with rapeseed crop, since price increased both on national and European level, and also the growing demand for biodiesel these two factors being in close connection. Even if the existing units have declined in recent years their actual production of biodiesel because of the massive import of biodiesel from North America and South America, the rapeseed crop is an opportunity because it has a high price for export. Thus, farmers which will cultivate rapeseed crop will benefit whether they will sell the production to local producers of biodiesel, whether they will export, thus contributing to the positive trade balance.

CONCLUSIONS

Romania has favorable conditions for cultivation of energy plants because of the favorable climate and highly fertile soils that

require minimum investments regarding fertilization;

To encourage farmers to plant energy crops it is required to continue the financial support from the government;

Growing energy crops on large areas will lead to lower costs of production (technologies, advanced equipment and of high capacity etc.);

Using biofuels in general and especially biodiesel is a welcome initiative in the world and in Romania both in ecological matter and as an alternative to the depleting fossil fuels.

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