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DRIVERS AND CHALLENGES OF BIOFUEL USE

Agriculture is starting to contribute to solving environmental problems by transforming food products to energy products. Crops can be used as biofuel, demands for crops have raised and this usage could be a paradox of agricultural markets — to produce them for food or for energy? While demand for agricultural goods has increased, their prices have also increased. Thus, food crisis took place in the world in 2007-2008. The aim of this paper is to give information about relationship between food and energy sector, recent developments and trends in agriculture and energy sectors in terms of prices for food and fuels and environmental policies.

Keywords: *agriculture; climate change; biofuel.*

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ЧИННИКИ РОЗВИТКУ І ПРОБЛЕМИ ВИКОРИСТАННЯ БІОПАЛИВА

У статті показано, що сільське господарство починає робити свій внесок у вирішення екологічних проблем шляхом перетворення продуктів харчування на енергоносії. Сільськогосподарські культури можуть бути використані як біопаливо, попит на них підвищується, і таке використання може стати парадоксом для сільськогосподарських ринків, що стали перед вибором: виробляти їжу або енергію? В той час як попит на сільськогосподарські товари збільшився, ціни на них також зросли. Таким чином у світі виникла продовольча криза 2007-2008 років. Надано інформацію про взаємозв'язок між продовольчою і енергетичною галузями, останні досягнення і тенденції в сільському господарстві і енергетиці щодо цін на продовольство і паливо та екологічної політики.

Ключові слова: *сільське господарство; зміна клімату; біопаливо.*

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ФАКТОРЫ РАЗВИТИЯ И ПРОБЛЕМЫ ИСПОЛЬЗОВАНИЯ БИОТОПЛИВА

В статье показано, что сельское хозяйство начинает вносить свой вклад в решение экологических проблем путем преобразования продуктов питания в энергоносители. Сельскохозяйственные культуры могут быть использованы в качестве биотоплива, спрос на них повышается, и это использование может стать парадоксом для сельскохозяйственных рынков, ставших перед выбором: производить пищу или энергию? В то время как спрос на сельскохозяйственные товары увеличился, цены на них также возросли. Таким образом в мире возник продовольственный кризис 2007-2008 годов. Предоставлена информация о взаимосвязи между продовольственной и энергетической отраслями, последние достижения и тенденции в сельском хозяйстве и энергетике в плане цен на продовольствие и топливо и экологической политики.

Ключевые слова: *сельское хозяйство; изменение климата; биотопливо.*

Introduction. Agricultural sector has been in a new corner since the beginning of XXI century. The food crisis happened in the world during 2007-2008 showing that agricultural sector has special characteristics and food prices are more sensitive even to small changes. Agriculture which is known as the basis and dynamics of the devel-

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opment of each nation has become not only a tool of food sector but also a tool of energy sector.

Due to using crops as biofuel, demands for crops have raised and this usage could be a paradox at agricultural markets — to produce food or energy? While demand for agricultural goods has increased, their prices have increased, too. Thus, food crisis took place in the world during 2007-2008 period.

In 2006 and 2007 in many countries we saw extreme weather events such as hurricanes, storms, droughts, floods etc. Those events drove people to think about environmental issues and climate change. Then in 2008 food crisis was the top of the agenda for almost all the countries, international and national organizations. The main driver of food crisis was biofuel demand.

Biofuel Use. Biomass is defined by Food and Agriculture Organization (FAO) as the organic fraction of agricultural products (including vegetal and animal substances), from forestry and related industries, as well as the organic part of industrial and municipal waste including wood, straw, energy crops, agricultural waste, agroindustrial waste, plants and animal waste. Bioenergy is the production of energy from biomass for using in transport, heat or electricity production (FAO, 2008).

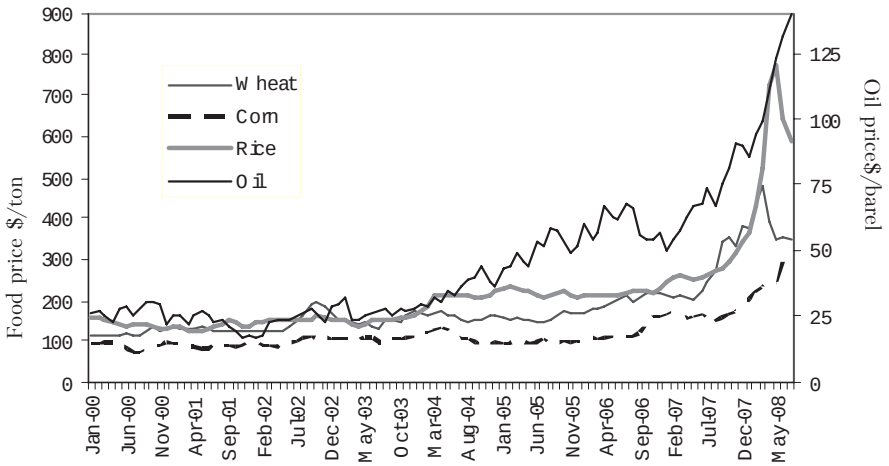
Biofuels are produced from biomass, but mostly are produced using agricultural and food commodities as feedstocks. The main biofuels are ethanol and biodiesel, so called "first generation biofuels". Both can be produced from a wide range of different feedstocks. Ethanol is produced from sugarcane, sugarbeet, wheat, maize, potatoes. Biodiesel is produced from oilcrops like rapeseed, soybeen, sunflower. The most important producers are Brazil and the USA for ethanol and the EU for biodiesel (FAO, 2008). "Second-generation biofuels" are produced from crop and forest residues and from non-food energy crops. Feedstocks such as algae are considered as "third generation biofuels". But at present the production of such fuels is not cost effective because there is a number of technical barriers that need to be overcome before their potential can be realized (Eisberg, 2006). Although, important programs have been launched in biofuels for transport since the end of the 1970s, the environmental benefits of their use have only recently attracted attention and now biofuels are more popular.

Drivers of biofuel. The popularity of biofuels today has mainly two drivers. The first of them is climate change, the second is high oil prices.

1. Climate Change: The fossil fuel is a big contributor to increasing the level of CO2 in the atmosphere which is directly associated with climate change. Global average surface temperature has been increasing since 1861. During the 20th century the increase has been 0.7°C. Globally, 1990s were the warmest decade; 1998 and 2005, the warmest years in the instrumental record, since 1861 (IPCC, 2007). According to forecasts many researches, temperature will go up in the future. The 2007 IPCC report projects that the climate could warm by as much as 5 C° over the next 100 years (IPCC, 2007).

The IPCC 2007 report also says that mainly human activities cause climate changes. CO2 emissions must be decreased. Instead of the fossil fuel, using ethanol-blend fuel and biodiesel would reduce greenhouse gas (GHG) emissions.

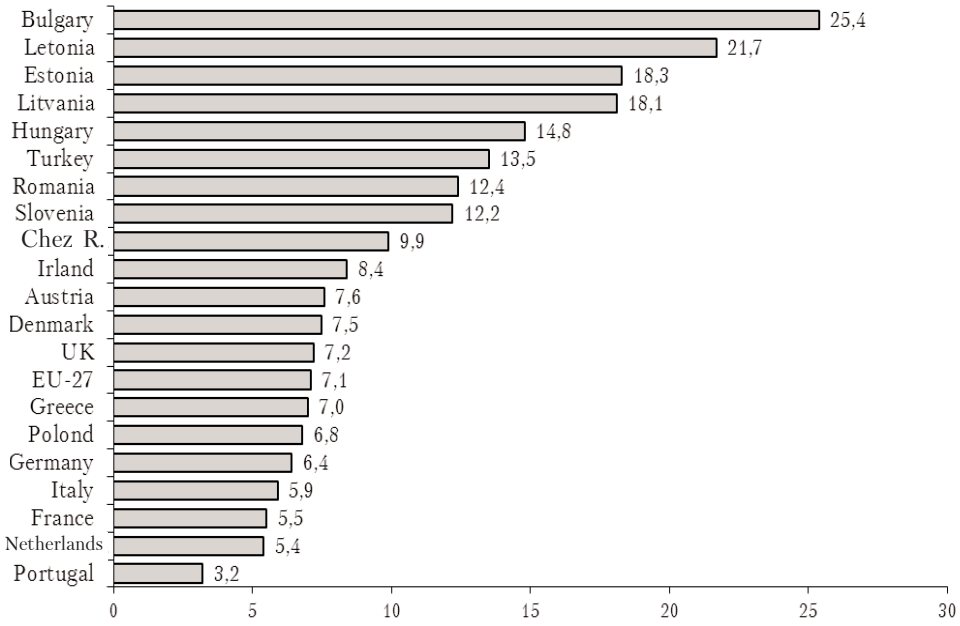
2. High Oil Prices: The second driver of biofuel use is high oil prices. As Figure 1 shows, oil prices began to get higher after 2003, and in 2008 oil price was 145 $/barrel which was the peak level. Biofuel use was one of the options against the high oil prices (Dellal, 2008).



Source: Dellal, 2008.

Figure 1. **Oil and crop prices**

Production and consumption of biofuels have increased dramatically in the past few years, driven largely by the policies aimed at enhancing energy security and reducing greenhouse gas emissions. Policy support for production and use of ethanol and biodiesel and the rapid rise of petroleum prices have made biofuels more attractive as substitutes for petroleum-based fuels (FAO, 2008).



Source: Dellal and Keskin, 2008

Figure 2. **Changes in food prices between April 2007 — April 2008 (%)**

Challenges. Agricultural commodity prices have risen sharply during the food crisis period, driven by a combination of reinforcing factors, but the main factors include, among others, the demand for biofuels (Figure 1). Food crises was the top on the agenda for governments. Almost all the countries had high food prices (Figure 2). Higher food prices sparked riots in many countries and have led to at least 40 governments impose emergency measures such as food price controls or export restrictions. The first and the most important challenge of biofuels is contribution to higher food prices due to competition with food crops.

This rapid growth in prices has many potential impacts on food security and the environment, because there are still people with food insecurity all over the world. High food prices hinder access to food for poor people, mostly in developing countries. Thus, food security is another challenge. On the other hand, countries aim at using biofuels in the future. Projections on both ethanol and biodiesel production show that many countries will increase their biofuel production. This is understood that biofuel will have important issue and have effect in agricultural markets in the next years.

One of the concerns in biofuel production that it is an income for rural people. Even if rural people get benefit via income from production and government support, the beneficiaries are mostly land owners. Vulnerable groups in rural areas are not expected to get benefit.

At the same time, conversion of the entire crop production to ethanol would correspond to 57% of the total petrol consumption according to Rajagopal et al. (2007). Under a more realistic assumption, 25% of each of these crops being diverted to ethanol production, only 14% of petrol consumption could be replaced by ethanol. Various hypothetical calculations underline that, in view of their significant land requirements, biofuels can only be expected to lead to a very limited displacement of fossil fuels. Nevertheless, even a very modest contribution of biofuels to overall energy supply may yet have a strong impact on agriculture and agricultural markets (FAO, 2008).

Conclusion. Biofuel is not the only way or the only solution for carbon emission decrease or of fossil fuel insufficiency. The choice of using crops for energy instead of food — even if it covers a small portion of energy needs — could affect the agricultural commodity markets much more than the energy markets. The 2008 food crisis is a good example for this.

Higher food prices affect firstly vulnerable groups like less developed countries and developing countries and poor people all over the world. On the other hand, even if agricultural production for energy could be an opportunity for rural people, land owners would get benefit instead of poor rural farmers.

There is a need to review existing biofuel policies in the international context in order to protect poor and food-insecure people. There is also a need to improve studies on the second and third generation biofuel technologies.

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