



Kateryna Melykh¹⁾

Sudhir Jha ²⁾

¹⁾ *Department of Environmental Planning and Environmental Engineering, Technical University Munich (Munich, Germany)*
kateryna.melykh@gmail.com



²⁾ *Department of Sustainable Resource Management, Technical University Munich (Munich, Germany)*
sudhirjha.gs@gmail.com

REGULATION OF BIOMASS PRODUCTION IN EU FROM GLOBAL SOCIO-ECONOMIC PERSPECTIVE

NORMATYWNE UREGULOWANIA PRODUKCJI BIOMASY W UE W UJĘCIU GLOBALNYM I SPOŁECZNO-EKONOMICZNYM

РЕГУЛИРОВАНИЕ ПРОИЗВОДСТВА БИОМАССЫ В СТРАНАХ ЕС С ТОЧКИ ЗРЕНИЯ ГЛОБАЛЬНОЙ СОЦИАЛЬНО-ЭКОНОМИЧЕСКОЙ ПЕРСПЕКТИВЫ

Abstract

In recent years a lot of discussions have been launched concerning the issue of whether the fertile agricultural land should be provided for the purposeful production of biomass. Although the use of straw and other agricultural residues in biomass proceeding is facing fewer critics, more arguments are put against planting energy crops. The biggest issue about it is the loss of soil fertility due to soil exhaustion by energy crops cultivation as well as wasting of productive land for the purpose other than food production at the time of hunger around the world. To discuss the real situation in the field of biomass and agricultural food production we will focus on the EU case with its sustainability targets. Besides that, the analysis from global socio-economic perspective will be also conducted. The research will be conducted based on the official statistical data, EU legislation and scientific argumentations.

Keywords: *EU Directives, biomass production, energy, agriculture, food security, biofuels, sustainability.*

Streszczenie

W ostatnich latach podejmowano wiele dyskusji naukowych, jak również politycznych, które miały odpowiedzieć na pytanie, czy żyzne grunty rolne powinny być

wykorzystane do celowej produkcji biomasy. Obecnie stosowanie słomy i innych pozostałości rolnych dla produkowania biomasy jest mniej krytykowane, natomiast więcej argumentów wynosi się przeciwko plantacji roślin energetycznych. Główne kwestie, które są przedmiotem dyskusji dotyczą utraty żyzności gleby z powodu jej wyczerpania składników pokarmowych z gleby przez uprawę roślin energetycznych, jak również marnowanie ziemi żyznej dla celów innych, niż produkcji żywności w czasie głodu na całym świecie. Aby przeanalizować rzeczywistą sytuację w zakresie produkcji i wykorzystania biomasy i produkcji żywności w zakresie działalności rolniczej w tym artykule skoncentrowano się na sytuacji UE z uwzględnieniem jej celów zrównoważonego rozwoju. Poza tym przeprowadzona została również analiza w ujęciu globalnym i z uwzględnieniem determinantów społeczno-ekonomicznych. Analiza została przeprowadzona na podstawie oficjalnych danych statystycznych, prawodawstwa UE i dotychczasowej wiedzy naukowej.

Słowa kluczowe: Dyrektywy UE, produkcja biomasy, energia, rolnictwo, bezpieczeństwo żywności, biopaliwo, zrównoważony rozwój.

Аннотация

За последние годы как в научной, так и в политической среде ЕС поднимался вопрос о том, стоит ли использовать плодородные сельскохозяйственные земли для целенаправленного производства биомассы. Невзирая на то, что использование соломы и других сельскохозяйственных отходов для производства биомассы, сталкивается с меньшим количеством критики, все больше и больше аргументов выдвигаются против выращивания энергетических культур. Самой большой дискуссией в этом контексте является потеря плодородия почв из-за их истощения путем выращивания энергетических культур. Важным также является вопрос использования плодородных земель для других целей, кроме как производства продуктов питания во время проблемы голода во всем мире. Для того чтобы обсудить реальную ситуацию в области производства как биомассы, так и производства сельскохозяйственных продуктов в этой статье мы сосредоточимся на ЕС с его целями устойчивого развития. Кроме того, будет произведен анализ с точки зрения глобальной социально-экономической перспективы. Исследование будет проводиться на основе официальной статистической информации, законодательства ЕС и актуальных научных трудов.

Ключевые слова: Директивы ЕС, производство биомассы, энергетика, сельское хозяйство, продовольственная безопасность, биотопливо, устойчивое развитие.

I. Introduction. Nowadays the world is facing climate changes, environmental degradation, scarcity of some resources as well as a negative impact on nature and human health from traditional fuel and energy production. To minimize these effects on the environment developed countries have set the targets to reach a better sustainability in production and transportation as well as efficiency in resource consumption “without compromising the abil-

ity of future generations to meet their own needs” (BRUNDTLAND, 1987). One of the most important issues in European Union as a big player in world’s economy is to achieve the 20% of all energy production, increase the energy efficiency by 20% and decrease the amount of CO₂ released by 20% around the member-states by the year of 2020. Additionally, the goal was set to have a minimum of 10% of biofuels in transport system by the

same year (EU COMMISSION, 2009).

To reach these objectives the biggest share is given to biomass production which includes the shift to biofuel, its blending and bioenergy supply. Thus, 60-70% of all renewable energy is given to biomass production which includes the shift to biofuel, its blending and bioenergy supply. Thus, 60-70% of all renewable energy in the EU will come from the biomass (LADANAI, 2009; BANSE, 2011). This statement is supported by the persuasion that the CO₂ stored in biomass is natural and while released to the atmosphere doesn't cause any misbalance in the amount of particles in it. German Biomass Sustainability Regulation states the decrease in CO₂-emissions in comparison to fossil fuels by 32% in wheat production and by 47% in raps (BIONACHV, 2007). Despite the fact that 70% of all biomass come from wood and waste materials, the third biggest role in its production plays agriculture. The usage of agricultural residues doesn't lead to any discussions as it is considered to be a continuation of the food proceeding process; they are utilized without any great negative impact on the environment. Unlike agricultural residues, the energy crops production is not being seen very positively among different social and political players. Ones claim that the production of energy crops is a part of overall agricultural production and has to be subsidized by government. However, the opponents emphasize on the side-effects such as the hunger in poor countries that cannot be overcome, when the land will be utilized for industrial purposes rather than food production. What is more, the harm caused to the fertile land and environment by monoculture and plowing will find its expression in the great loss of productive lands. Such alternative way of land use finds its reflection in the debates among scientists and politicians in Europe and around the world. Other threats such as deforestation, soil erosion, overuse of fertilizers are also stimulating the criticism.

For European Union these concerns also include the politics of regional development and regional food supply, which can be observed in the legislation, especially in Common Agricultural Policy.

To understand to what extent are these concerns appropriate, we will research three questions: 1) *what are the impacts of EU policies on biomass and food production in EU?* 2) *what socio-economic threats and benefits brings the biomass production?* 3) *is the energy crops production competing with food production in EU?* Some of the researches have stated (LADANAI & VINTERBÄCK, 2009) that such concerns shouldn't take place as only 0.19 % of the world's land and only around 1.5% of world's agricultural land is occupied by the biomass production. Though the numbers for the whole world seem to be small, we should analyze more deeply the diversity in regions, which in our case will be focused on the European Union as a big market and one of key players in this field.

II. Legislative background of biomass production in EU

A few of the European laws are to some extent related to the topic of biomass production. To find out more about political perspectives of biomass production on agricultural land we have focused our investigation on the Directives on Energy Taxation (2003), on Renewable Energy (2008), Fuel Quality Directive (2009), Common Agricultural Policy and CAP Health Check (2009).

EU Directive on Renewable Energy (2009/28/EC) was implemented to promote the further reduction of CO₂ emissions, efficient energy supply, technological and regional development. Concerning our topic there is a clear statement of not converting the agricultural land for the aim of biomass production, if the carbon stock loss will not be compensated by the GHG emission saving from the usage of biofuels (EU COMMISSION, 2009). What is more, the demand is for a shift to 2nd and 3rd generation biofuels, production of which does not affect food production. The sustainability criteria for biofuels production have to be taken into account. 18 voluntary schemes provide legal assessment and certification procedures for all the products from biomass. Without receiving the certificate, biofuels cannot be presented on the market. Another important document is the EU Biofuel Directive (2003/30/EC), which has set the goal in

long perspective to achieve 2% of biofuels in transportation in the year of 2005, 5.75% in 2010 and 10% in 2020 (BANSE, 2011). This target is applicable for the EU as a whole and doesn't require same targets for each member state. The goal is to be reached mainly by utilization of 2nd and 3rd generation biofuels which was later reflected in Renewable Energy Directive and Fuel Quality Directive (2009/30/EC). Additionally, those producers who meet the requirements on environmental protection and sustainability criteria receive a financial support for biomass supply and fuel tax exemptions to make biofuels more competitive on the market. According to Energy Taxation Directive (2003/96/EC) all the subsidies are to be paid by the states after approval of European Commission.

Until the year of 2009 production of biomass was considered a part of agricultural land production and energy crops producers were receiving same budgetary support as other farmers. After the EU CAP Health Check the direct support for biomass production was abolished. The reason for it was that the feedstock for biofuels requires highly fertile soil and the use of strong fertilizers, pesticides and water to get an economically efficient yield (BANSE, 2011).

European Union is also promoting the adoption of agri-environmental measures which are the voluntary procedures to be implemented by farmers in all member states for the sake of farmland protection, extensification of agriculture, preserving natural qualities of landscape and environment. Participation in such programs is compensated by financial aid that farmers receive to cover the expenses. These measures are somehow slowing down the energy crops production in order to preserve soil, water and biodiversity.

So, according to the European Directives the use of biomass (mainly energy crops in our case) is to be assessed including the sustainability criteria to be met in agricultural, energy and transport sectors. Production of energy crops is regulated by the Directives on sustainable agricultural production and preservation of natural habitats, which shows that EU is trying, on one hand, to set the high renewa-

ble energy objectives, but, on the other hand, to lower the impact on environment while reaching these goals.

III. Socio-economic threats and benefits of biomass production.

Biomass production and energy crops cultivation as its part make a relatively gross impact on the social sphere and economic indicators of the countries' performance. As a part of political discussion the great matter has been given to this issue both on national and international levels. Additionally to the 2020 goal achievement other reasons have become the key elements for the promotion of biomass production. The rising oil prices, the dissemination of feedstock for energy reasons, and political issues - such as climate change - have catalyzed the dispute.

Some of the social issues related to biomass production that should be mentioned are: the rise in food prices; adverse labor conditions; land acquisition for energy crop production; energy security and indirect land use change. However, most of these problems occur mainly in developing countries. On the contrary, the social impacts of biofuel within Europe are mostly positive. Even though Europe is also facing the negative ecological impacts such as the intensification of the land use; high use of pesticides and fertilizers; and inefficient water consumption – biomass production has created new jobs, diversification of income opportunities for European farmers, and the reduction of energy dependency in rural communities. Some other concerns raised by the stakeholders, however, also emphasize the decrease in the aesthetic value of the landscape due to the monoculture.

Since 90s XX century the main objectives of European bioenergy policy have been to reduce greenhouse gas emissions, dependence on the imported fossil fuel and to diversify sources of energy supply. Moreover, the policy was also directed towards generating employment in agriculture and rural areas as well as promoting innovation and technological development (ECOLOGIC BRIEFS, 2012).

As a result of political targets along with the incentives in biomass production and support from US and Brazil, EU has expanded its

biomass production. The contribution of agricultural biomass into renewable energy production in EU has reached 17.8% by the year of 2013; the share of renewables in total energy consumption was observed on the level of 11.8% (EUROSTAT, 2015). The introduction of EU Renewable Energy Directive caused a significant rise in biofuel production, however, being reflected in negative effects on the environment. Thus, the focus of EU politicians has shifted to environmental aspects of biofuel production such as decline in GHG emission, lowering the impact on biodiversity and decreasing water consumption. Similarly, concerns have been raised towards the social implication of biomass expansion mostly on developing countries. As Europe cannot fully supply itself with the demanded amount of biomass, the import from countries like Ethiopia, Mozambique or Laos has significantly risen. With the great land grabbing for energy crop production, these countries have experienced high level of food insecurity.

In less than one decade, world biofuel production has quintupled from less than 20 billion liters/year in 2001 to over 100 billion liters/year in 2011. The steepest rise in biofuel production occurred in 2007/2008, concomitantly with a sharp rise in food commodity prices, quickly accompanied by food riots in the cities of many developing countries. In comparison with average food prices between the years 2002 and 2004, globally traded prices of cereals, oils and fats have been on average 2 – 2.5 times higher in 2008 and 2011/12, and sugar prices have had annual averages of 80% to 340% above their 2000/04 prices (HLPE, 2013). Oil prices strongly influence the price for bioenergy and therefore biomass. Simultaneously, high food prices also compete with the establishment of agricultural biomass production. The extra demand for such type of production has resulted in a global increase in agricultural commodity prices and the creation of a floor price effect for competitive feedstock (BANSE, 2011).

As a part of the implementation process for EU 10%-target, member states were obliged to develop a National Renewable Energy Action Plan (NREP) in which they outlined their

actions to reach it. According to such Plans, member state is supposed to meet the target through 1st generation biofuel. As a result, a country has to increase its fuel consumption by 17.2 Mtoe until 2020 compared to 2008 level. The Netherlands Environment Assessment Agency estimates that 20–30 million hectares will be required for the EU to meet its 10% target in the transport sector, with 60% of supplies imported. BOWYER (2011) concludes that reaching the 10% target in EU member state would create between 4.1 and 6.9 million hectares Indirect Land Use Change both within and beyond the European borders.

Biomass production requires large land areas which investors try to obtain through big scale land acquisition, particularly in developing countries. This can have severe consequences on rural population there. According to the reports from Land Matrix Partnership (2012) in last ten years around 203 million hectares of land have been sold, leased, licensed or in negotiation with the significant proportion of land further devoted to energy crops production. Most of these have taken place since 2008 and have involved international investors' participation. According to the World Bank (2010), the total land area for biofuel production has more than doubled between 2004 and 2008, partly due to land grabbing. The land matrix partnership points out that 57% of all land affected by energy crops cultivation is utilized for the purpose of products export to industrialized countries. In Africa this share has reached the level of 65% (ECOLOGIC BRIEFS, 2012).

In Europe itself the greatest potential for the development of biomass production sector has Eastern Europe as the land there is more appropriate for the energy-consuming crops. In this region 20 to 30% of the agricultural land can be dedicated to the biomass production (INTELLIGENT ENERGY EUROPE, 2011). Politicians, however, are concerned about the growing production of energy crops inside the EU. Main argument is that such land-use threatens the food security and is highly ineffective. To understand the reasonability of such concerns, we have analyzed the data that show a share of energy crops production in all

utilized agricultural areas and European land which is still available for biomass cultivation (Tab.1). For research we have chosen 15 coun-

tries with the highest rate of energy crops production.

Table 1. Share of agricultural land devoted to energy crops production and land available for further enlargement of biomass production rate

Countries	Utilized agricultural area (ha)	Share of land under energy crops (%)	Land with potential for energy crops production
Belgium	1 358,0	4,5	< 6,5 %
Bulgaria	4 475,5	5,77	25 - 31%
Czech Republic	3 483,5	2,99	25 - 31%
Denmark	2 646,9	3,59	17 - 31%
Germany	16 704,0	9,35	12 - 20%
Estonia	940,9	5,31	17 - 31%
Spain	23 752,7	1,21	12 - 17%
France	27 837,3	4,86	12 - 17%
Hungary	4 686,3	0,39	25 - 31%
Austria	4 686,3	1,22	17 - 31%
Poland	4 686,3	3,84	25 - 31%
Portugal	4 686,3	0,19	17 - 31%
Romania	4 686,3	12,13	25 - 31%
Sweden	3 066,3	3,23	< 6,5%
United Kingdom	16 881,7	2,1	12 - 17%

Own interpretation of data from EUROSTAT, INTELLIGENT ENERGY EUROPE

According to the data presented in the table 1 the highest rate of land devotion for biomass production can be observed in Romania (12,13%), Germany (9,35%) and Bulgaria (5,77%). In general, the index for the whole EU lays on the level of 2,97%. However, there is still 20-30% of land potential for the expansion of energy crops production in member-states. Therefore, we can state that Europe is not overusing its potential and the threat for European food security cannot be foreseen. What is more, food and biomass demand can be easily fulfilled with the import.

IV. Discussion & Conclusion

The potential impact of biofuel policies on social and economic processes can differ widely depending on the national and local conditions and on the decision to utilize specific technologies and feedstock.

Although European countries mainly win from the promotion of sustainability targets by 2020, they cannot fully accomplish all the related tasks themselves due to the scarcity of the resources (land for biomass production) or due to the strict limitations in the legislation.

Thus, CAP and agri-environmental measures prevent the usage of the fertile land for energy crop production, even though the potential of this land is huge. Consequently, EU has to encourage this type of production in developing countries and import the feedstock.

As the analysis conducted by (HLPE, 2013) with the use of Computable General Equilibrium (CGE) states, Sub-Saharan Africa has been one of the highly impacted areas due to EU-RED policy, especially such countries as Mozambique and Tanzania. These countries are equally poor; however, they differ in energy and food dependencies. The simulation showed that the direct impact of high food and high fuel prices leads to sharp decline in welfare index. On the other hand, it also proved that implementation of large scale biomass production for export purposes can result in an overall increase in GDP by 0.65% (HLPE, 2013). Therefore, it can be seen that the development of biofuel production is characterized by global and local, positive as well as negative, short-term and long-term effects.

Another controversy regarding the benefits

and drawbacks of EU biofuel and renewable energy targets is that the mandatory RED sustainability criteria are only dealing with environmental impacts. They don't focus on the social impacts inside as well as outside of the EU. Moreover, the actual driving factor of the biofuel expansion and all associated drawbacks has been the 10% target set out by EU Directives. It has been recommended by different scientist (BANSE, 2011; BLANCO, 2010)

and NGOs (ECOLOGIC BRIEFS, 2012) to decrease or to postpone the significance level of target in order to alleviate the pressure and provide the time for sustainability certification schemes to start operating properly. The main focus should also be oriented on the development of biofuel in the way of limiting its potential negative impact and strengthen the potential positive impact (HLPE, 2013).

Bibliography:

1. Banse M. et al. (2011). Impact of EU biofuel policies on world agricultural production and land use. *Biomass and Bioenergy*, 35(6), c. 2385—2390.
2. Blanco F. M. et al. (2010). Impacts of the EU Biofuel Target on Agricultural Markets and Land Use - A Comparative Modelling Assessment. Joint Research Centre of European Commission. — 108 p.
3. Banse M., Sorda G. (2009). Impact of different biofuel policy options on agricultural production and land use in Germany. Contributed paper at the GeWiSoLa Conference. 16 p.
4. Bowyer C. (2011): "Anticipated Indirect Land Use Change Associated with Expanded Use of Biofuels and Bioliquids in the EU — An Analysis of the National Renewable Energy Action Plan," IEEP.
5. Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
6. Directive 2009/30/EC - amendment to Directive 98/70/EC on environmental quality standards for fuel (Fuel Quality Directive) .
7. Ecologic Briefs (2012): "The social dimension of EU Biofuel policy." A report by Ecologic Briefs on International Relations and Sustainable Development. Germany, 2012.
8. HLPE (2013). Biofuels and food security. A report by the High Level Panel of Experts on Food Security and Nutrition of the committee on World Food Security, Rome 2013.
9. Ladanai S., Vinterbäck J. (2009). Global potential of sustainable biomass for energy. Swedish University of Agricultural Sciences. Report №13. — 29 p.
10. World Bank (2010): "Rising global interest in farmland: can it yield sustainable and equitable benefits?" Washington.