INTERNATIONAL BIOMASS TRADE AND SUSTAINABLE DEVELOPMENT: AN OVERVIEW[1]

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Abstract: *It is crystal clear that the neoclassical economical theory, despite being probably the best growth model ever invented by man, tickled a cost of environmental degradation which can threaten our wealth and even our existence. For this reason, the concept of sustainable development (SD) is so empathic, being considered probably the best theoretical alternative invented by man to standard growth, because of its vision of a better world, where economics, society and environment are intimately linked. Thus, all human activities have to adapt to this new paradigm, in order to achieve its goals. From the economical perspective, production, consumption and trade must incorporate a kind of sustainable type of activity. In the recent years, growing demands in energy use and the increase of oil and coal prices, have led to the usage of new energy sources such as biomass, water, solar, wind and geothermal energy. This is why we propose in this paper to present an overview of international trade in biomass reported to the philosophy of SD. In short, we want to give an answer at two questions: how much is biomass trade sustainable and what risks may arise if the main source of energy used today, based on fossil fuels, will be totally substitute by biomass? To be sustainable, biomass, must meet certain criteria, such as: to possess a high capacity for regeneration, in a relatively short time; to offer a better efficiency compared with the traditional fossil fuel sources; to be less or non-polluting, to be used in solid, liquid and gaseous form; to have a broad applicability in production and consumption; to have a competitive level in terms of costs and prices for transport or storage, in both stages, as a raw material or as a finished product; to be a good substitute of traditional fuels (gasoline or diesel), without the necessity for structural changes of the of the engine. The article will conclude that the uprising trend of the EU biomass trade and consumption will continue, because of grown concerns of the EU Member States regarding the effects that greenhouse gas emissions have over the environment and over the quality of life standard, despite the critics which states that biomass production may have negative environmental effects, leading to massive deforestation and destruction of soil, water sources and natural habitat.*

Keywords: sustainable development, international trade, environmental impact, biomass, biofuels
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INTRODUCTION

If we take into account one of the simplest but self speaking theoretical construction of the classical school of economics, named *Crusoe Economics* (Rothbard 1998: 29), we learn that economical practices began as a result of natural labor division and exchange. From the very

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beginning, Crusoe's existence – which has landed on his island, standing face-to-face with nature – is simplified to his instinctive decision making process, necessary to satisfy basic life sustainable needs. In short, he must learn *what*, but mainly *how* to achieve a proper *mix of land and labor*, in order to bring his ends and purposes into effect. The picture changes when, in this idyllic society, another individual has landed. The newcomer, as well as the legendary hero, must mix his labor with land in order to survive. Naturally, the two lean to attain their ends with minimal effort, choosing firstly the simplest activities, but as they acquire technological knowledge the end products are becoming more complex, reaching the point where their production exceeds domestic consumption. Keeping in mind that their skills and interests differ, they have to shape their economic activities of production and exchange in accordance with David Ricardo's *Law of Comparative Advantage*. And this is how, as Rothbard points out, "the process of exchange enables man to ascend from primitive isolation to civilization" (Rothbard, 1998: 36).

This short story is important mainly because it argues that "economics has revealed a great truth about the natural law of human interaction: that not only is *production* essential to man's prosperity and survival, but so also is exchange" (Rothbard 1998: 35). Furthermore, such an analysis – of the interaction of two people in an uninhabited island, as abstract and simplistic as it is, makes sense when the spectrum of thought widens to the size and complexity of contemporary society.

Indeed, production, consumption and especially trade, under classical and neoclassical economic philosophy, have generated economic growth and social prosperity. But this type of development tickled a cost of environmental degradation, which over time, became big enough to jeopardize our wealth and even our existence. The interdependent relationship between economy and environment have been largely ignored by the neoclassical economists, where in their elegant economical growth theoretical constructions, the natural environment has not been included. However, since the early '70s, there were some vices that, through their rigorous studies, began to draw attention to this issue, many of them speaking even of an imminent environmental, economical and consequently a wellbeing crisis. A few years later these initiatives have echoed in the developed world, giving rise to a new paradigm which would link economics with the environment in a different kind of global development, under the name of *sustainable development*. Therefore, eco-efficiency and pollution control quickly became targets for technological research and development. Meanwhile, trade has adapted to change and – for example – a new international market of biomass and bio-fuels emerged and quickly expended.

Given this example, we propose, in this paper, to perform an analysis of international trade in biomass reported to the philosophy of sustainable development. In short, we want to give an answer to two questions: how much is biomass trade sustainable and what risks may arise if the main source of energy used today, based on fossil fuels, will be totally substitute by biomass? For doing this, the paper is organized as follows. The first section will briefly explore for *what* and for *who* is the concept of sustainable development addressing, in order to emphasize on the one hand the energy dependency of people and on the other hand, the need to change the global optics regarding the sources through which this energy is produced, optics that embraces the idea of substituting non-renewable resources with renewable ones in the production process. The following section will focus on the biomass as an alternative to fossil fuels, on the trend in international trade of biomass – focusing mainly on European space – the purpose being to capture the dynamics of the demand for these products and last but not least, to draw the attention on the risks that we might face in the event that the traditional fuel consumption will be replaced exclusively by biomass.

1. SUSTAINABLE DEVELOPMENT AND BIOMASS

Although environmental issues were put on the carpet two centuries ago prefaced in the writings of the classical economist Thomas Robert Malthus, in his *Essay on the Principle of Population*, the main literature focused on the subject beginning with the decade seven of the last century, through a series of papers, reports and international conferences, which worth mentioning: the club of Rome report, entitled *Limits to Growth*, published in 1972 by Dennis L. Meadows *et al.*; *Plan B* book series by Lester Brown, founder of the World Watch Institute (WWI) in 1974 and the Earth Policy Institute in 2001. The most important conferences gathered representatives from all over the world to discuss the problems with the environmental - economical and social relationships, took place in Stockholm (1972), Rio de Janeiro (1992), in Kyoto (1997) and in Johannesburg in 2002.

All these events have put into the light the environmental issues focusing firstly on the level of consumption of natural resources, in particular the imminent depletion of the non-renewable ones in the near future, secondly, on the problems with pollution control and adverse effects of human activities over environment and biodiversity, and thirdly, on the never-ending bad story of poverty.

The way ahead was outlined and defined in what is called sustainable development in the Brundtland Report entitled *Our Common Future*, published in 1987, when the new concept was defined as "the kind of development that meets the needs of the present without compromising the

ability of future generation to meet their own needs" (Mihai and Borza 2009: 86). Sustainable development – thus became the common language of economists, ecologists, sociologists, philosophers and so on – has the task of finding a linkage between the environment and the society (who exploits it), to improve the degree of compliance between them, in order to be able to continue growth and development for us and for the ones who will replace those who live today.

1.1. **Biomass resources**

The influence of international trade over environment and welfare cannot be questioned, the causal links between these different aspects of life are intimate enough so that any issue caused by internal or external incentives in the market, finding – with little or no doubt – correspondent effect in the social and environmental side.

To be sustainable, biomass, which is considered alternative sources of energy, must meet certain criteria, such as: to possess a high capacity for regeneration, in a relatively short time; to offer a better efficiency compared with the traditional fossil fuel sources; to be less or non-polluting, to be used in solid, liquid and gaseous form; to have a broad applicability in production and consumption; to have a competitive level in terms of costs and prices for transport or storage, in both stages, as a raw material or as a finished product; to be a good substitute of traditional fuels (gasoline or diesel), without the necessity for structural changes of the of the engine, etc.

For these reasons, biomass resources appear, in a good extent, to provide a compromise between utility and eco-efficiency, having a real potential for sustainable energetic development.
The most important biomass energy sources are made of wood and wood waste, agricultural crops and agricultural byproducts from waste, waste derived from food processing and other plant and animal waste. Among these, the largest share in manufacturing biomass is wood and wood waste (64%), municipal solid waste (24%) and agricultural waste (5%) (Demirbas et al. 2009: 1746).

In industrialized nations, biomass is mainly used as a source of fuel used directly or indirectly (through combinations in different percentages between traditional and bio-fuels). The most used biofuels are *ethanol* and *biodiesel*. The first is produced from several categories of biomass and used as a substitute for gasoline. It can be used 100% as a transport fuel or mixed with gasoline in different proportions. Used in blend, ethanol offers the advantage of significant reductions in petroleum consumption and in greenhouse gas emissions, due to high oxygen concentration.

The second one, biodiesel, can replace diesel in the same way that ethanol replaces (or blends with) gasoline, except that biodiesel can be used only if changes are made to the engine structure.

The great advantage of biodiesel lies in the source of its production. It can be produced from rapeseed oil or coconut oil or even recycled cooking oil.

In the European Community, demand for biofuels is growing, and as such, international trade in these products are, for some time now, on an upward trend, described briefly in the following.

2. INTERNATIONAL TRADE WITH BIOMASS

With the diversification of the economies and growing concern of nations in fighting and controlling the devastating effects of their gas emissions and in accordance with the gas emission targets under Kyoto Protocol, the use of biomass has become more than necessary. One important means of achieving this objective is to increase the rate of renewable sources in total of energy supply. Thus, the European Union proposed, in the Renewable Energy Directive, a minimum of 35% to reduce the gas emissions, in terms of the agricultural and forestry biomass, solid and liquid biofuels.

Growing demands in energy use and the increase of oil and coal prices have led to the development of new energy sources such as biomass energy, water energy, solar, wind and geothermal energy.

Table 1 - Energy sources in total primary energy

Energy Sources	2008	%
Nuclear energy	241.763	28,7
Solid Fuels	177.348	21,0
Natural gas	168.116	19,9
Oil	107.351	12,7
Renewable Energy	148.134	17,6
which:		
biomass and waste	102.315	69,11
hydro electricity	28.147	9,0
wind energy	10.165	6,9
geothermal energy	5.778	3,9
solar energy	1.729	1,2

Source: Eurostat, data processed by Rusu Nicoleta at Apr 10, 2011

In 2008, approximately 18% of the European energy consumption came from renewable sources, where 70% from those came from traditional biomass production and 9% from hydro electricity. The new renewable energies (wind, geothermal, solar and biofuels) have a large and growing area. According to the European Commission, the biomass represents 4% from the EU energy needs. European Commission Action Plan sets out measures to increase biomass by creating

incentives and removing barriers to market development, further promoting biofuels and finding new opportunities for the developing countries (European Commission).

The literature review reveals that Latin America, Sub Saharan Africa and Eastern Europe, North-East Asia and Oceania will be the most important biomass producers in the long term, while the main demand will be found in OECD countries and Asia South East, which means that one of the most important role trade will be played by biomass (Heinimo and Junginger 2009: 1311). As the demand for biomass products is increasing, and international sales market is in developing, these resources are unequal distributed in different parts of the world, the biomass trade is in a continuous growth among the European Union countries.

According to the European Commission reports, the EU is a net importer, in the present the rate of energy import dependency is 54%, and while in 2020 is expected to lead to an addiction rate of 70% if no measures will be taken to increase production of domestic energy. Although fossil fuels can't be replaced with renewable resources, it can be taken to combine them with those from renewable resources in order to obtain the desired effect, which is reducing the gas emissions (Magar et al. 2010: 2).

The European Union is far from being the largest producer of biomass; it must then rely on imports, becoming a net importer. Thus, ethanol, vegetable oils, firewood, coal and wood pellets are the most important products which are currently the most traded energy purposes. They may be imported and used in their unprocessed shape or can be used as raw materials, in terms to be exported. In the mentioned period (Table no. 2.) reflects the rate of imports dependence of European Union, emphasizing it in 2008.

Table 2 - International Trade biomass EU27, 2007-2008

	2007 TJ(GCV)	**2008 TJ(GCV)**
Primary production	4094966	4283722
Imports	211434	245111
Exports	93257	112631
Stock changes	-7567	-10511

Source: Eurostat - Energy balance sheets, 2007-2008 data processed at Apr 15, 2011 by Nicoleta Rusu

In 2008, primary production of biomass was 188 756 TJ higher than the previous year, this upward trend mainly thanks to the growing importance of biomass energy.

Although the European Union is a net importer of energy, biomass imports are relatively small. In 2008, imports of biomass were 2,4% of total primary supply, and according IEA, in2009 they have raised to a level of 4,5% of total primary supply (International Energy Agency).

Because of insufficient production, member states dependent on imports of biomass, they use increasingly more often other EU member States or beside.

According to the European Commission report on the sustainability requirements for the use of biomass resources for electricity and gas, heating and cooling, increased trade is attributable to the form of pellets (a type of biomass, generally made from waste forestry industries) (European Commission).

Pellet production and consumption has increased in recent years, EU countries registered a high consumption, so a number of countries outside the EU produce wood pellets only for the European market. The biggest consumers of EU pellets were Sweden (1.8 million tons), Denmark, Holland, Belgium, Germany and Italy (all about one million tons), the main suppliers being Canada and the United States and Australia with a contribution of Argentina and South Africa. According to EAI reports, the European Union in 2009 imported pellets worth of 3,9 million tones, of which half were EU inside imports.

An overview of the biofuels trade shows that the largest global producers of ethanol are the U.S. and Brazil; the EU is a net importer. In 2009 estimated data shows that were traded 40 - 50 PJ of ethanol. Data on trade in ethanol are imprecise because of its multiple uses and lack of appropriate codes for biofuels in global trade statistics. In 2009, EU states have produced biodiesel of around 334 PJ (7,04 million tons), the main producers are Germany, France, Spain and Italy (International Energy Agency).

Production of biodiesel in the European Union represents two thirds of world production of biodiesel. According to the EAI report, biodiesel trade in 2009 totaled 80 PJ (1,60 million tons) from a one PJ in 2005.

Import dependence varies between Member States, this being due to uneven spread of renewable resources. Thus, the Netherlands, Denmark and Britain are major countries producing of biomass, being the only member states where the ratio of import/export is negative, this being due and rich endowment of renewable resources and their processing and refining capacity.

3. BARRIERS IN INTERNATIONAL TRADE OF BIOMASS

Over the time the demand for biomass products has increased, which led to an intensification of international trade, development that was hampered by a number of barriers.

We define a "barrier in international trade in biomass" an issue that may directly or indirectly affect the development of the biomass trade to final consumers. Thus, although the use of these

products on the environment is undeniable, there are many voices critical regarding the European Commission's position to achieve by 2020 a level of 10% use of biofuels. They support the idea to reduce the proportion up to 4% by 2015. Arguments supported by the members of the European Parliament where about the negative effects of biofuels over the cultivated areas, leading to massive deforestation, on soil, on water. Other critics have been on the effects of biomass would have it on food prices, increasing those.

Major obstacles to international trade of biomass can be referred to the tariff, especially affecting the ethanol trade, while logistical barriers have a greater impact on trade with pellets. Technical barriers relate to physical and chemical descriptions of fuels, including biofuels, were introduced to ensure the safety and health of consumers.

To counteract the effects mentioned above, the main importing countries began to develop biomass national sustainability requirements for bioenergy, which led to the creation of some systems of certification (voluntary and mandatory) in agriculture, forestry and energy sectors (European Commission).

CONCLUSION

International trade of biomass produced by the European Union has intensified in recent years and this upward trend may continue in the future because of growing concern of the EU Member States regarding the sustainability and the effects that their greenhouse gas emissions have over the environment. Although there have been many critics over the sustainability of biomass products, their effects on the environment remain compelling. A step towards a wider application of biomass should be a more pronounced promotion policy of biofuels and the effects they have on our environment.

The EU Member States must intensify its efforts to increase investment in the renewable resources by supporting and encouraging the production of biomass and the adoption of policies that support production, utilization of renewable energy and providing incentives for biomass production and consumption at national and local levels.

REFERENCES

Bursi, C. (2009) *Renewable Energy, Legal Basis and Objectives*, Accessed at Apr 12th 2011, http://www.europarl.europa.eu/ftu/pdf/en//FTU_4.13.4.pdf.

Common, M., Stagl, S. (2005) *Ecological Economics. An Introduction*, Cambridge, UK: Cambridge University Press.

Demirbas, M., Fatih, B.M., Balat H. (2009) *Potential contribution to the sustainable energy development*, Energy Conversion and Management 50(2009) 1746-1760.

European Commission (apr 2011), *Opinion of the Regions Committee on the sustainability of biomass*.

European Commission Report to the Council and European Parliament committee on sustainability requirements for the use of renewable biomass and gas for electricity, heating and cooling SEC (2010) Accessed at apr 8th, 2011 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0011:FIN:RO:HTML.

Heinimö, J., Junginger, M. (2009) *Production and trading of biomass for energy – An overview of the golbal status,* Biomass and Bioenergy 33(2009) 1310-1320.

IEA Bioenergy, Summary, synthesis and conclusions from IEA Bioenergy Task 40 country reports on international bioenergy trade, apr 2011, accessed at Apr 16, 2011 http://www.bioenergytrade.org/downloads/summary-synthesis-and-conclusions-from-iea-bio.pdf.

Lehtonen, M. (2004) *The environmental – social interface of sustainable development: capabilities, social capital, institutions,* Ecological economics 49(2004) 199-214.

Lewandowski, I., Faaji, A.P.C. (2006) *Steps towards the development of certification system for sustainable bio-energy trade,* Biomass and Bioenergy 30(2006) 83-104.

Magar et al. (2010) *Growing trade of bioenergy in the EU: Public acceptability, policy harmonization, European standards and certification needs*, Biomass and Bioenergy (2010), doi:10.1016/j.biombioe.2010.10.012, p.2

Mihai, C., Borza, M. (2009) *Dimensiuni ale dezvoltării durabile în România*, Iaşi, Romania: Ed. Universităţii "Alexandru Ioan Cuza".

Neumayer, E. (1999) *Weak versus Strong Sustainability. Exploring the Limits of Two Opposing Paradigms*, Cheltenham, UK: Edward Elgar Publishicg Limited.

Preda, D. (2002) *Ocuparea forţei de muncă şi dezvoltarea durabilă*, Bucharest, Romania: Editura Economică.

Rothbard, N.M. (1998) *The Ethics of Liberty*, New York: USA, New York University Press.