Implications and policies about the first generation BIOFUELS: an international and EU analysis

ANNARITA PAIANO*, GIGLIOLA CAMAGGIO*, LEONARDA LOBEFARO*

Jel classification: Q27, Q28

Abstract

The implications associated with the increasing trade in both raw materials and biofuels show several issues worldwide. The main ones are related to the "food versus fuel" debate, the exploitation of areas with high carbon stock, the direct and indirect effects in the developing countries, the link between fossil fuels and biofuels prices, the effects of the support policies by governments and the establishment of sustainability standards and certification schemes for biofuels. In this sense, the concerns expressed by international organizations and European ones in the development of common schemes to authenticate the origin of biofuels and/or raw materials according to certain requirements, such as the conservation and protection of ecosystems.
The authors' research aims to describe the current status of production and trade of the biodiesel and bioethanol, the so-called biofuels of the first generation, and the several economic, social and environmental concerns about this sector. Furthermore, the recent evolution of the world and the European trade of these biofuels have been analysed for underlining the positive oncoming developments and, at the same time, the implications that this will bring.

Keywords: international trade, first generation biofuels, support policies, sustainability criteria.

Rèsumé

Partout dans le monde les conséquences associées à l'accroissement des échanges de matières premières et de biocarburants montrent plusieurs enjeux. Les plus importants sont liés au débat sur les "aliments contre les carburants", l'exploitation des zones à haute teneur en carbone, les effets directs et indirects dans les pays en développement, le lien entre les combustibles fossiles et les prix des biocarburants, les effets des politiques de soutien adoptées par les gouvernements et l'établissement de normes de durabilité et de certification pour les biocarburants.
En ce sens, les préoccupations exprimées par les organisations internationales et européennes dans la mise au point de régimes communs pour authentifier que l'origine des biocarburants et/ou des matières premières satisfait certaines exigences, telles que la conservation et la protection des écosystèmes.
Cette recherche vise à décrire l'état actuel de la production et le commerce du biodiesel et du bioéthanol, ce qu'on appelle les biocarburants de première génération, et les plusieurs préoccupations économiques, sociales et environnementales relatives à ce secteur. En outre, l'évolution récente du commerce mondial et européen de ces biocarburants a été analysée pour souligner les développements positifs et, en même temps, les impacts futurs.

***Mots clés**: commerce international, biocarburants de première génération, politiques de soutien, critères de durabilité*

1. Introduction

In the coming decades the biofuels policies will be more and more motivated by political concerns aiming to reduce the dependence on oil, also to improve the environment and increase agricultural incomes. This idea has made biofuels politically popular and it will lead to a sharp increase in the global trade of biofuels and their raw materials.

Despite government efforts to encourage their use, biofuels currently remain expensive to produce, and the demand remains low. Mandatory biofuels blends, used to promote biofuels, make biofuels a complement to petroleum rather than a significant substitute. On the one hand biofuels can offer answers to the need of energy supply in the developing countries, on the other hand in the OECD countries there is a widespread opinion that a domestic source of energy harvested from domestic crops could limit dependence on foreign oil. For this reason most OECD countries have developed policies of subsidisation and protection for agriculture, that international trade negotiations within the framework of the World Trade Organization (WTO) have unsuccessfully tried to discourage.

At present, however, biofuels are differently used in the world; the bulk of biofuels demand comes from industrialized and newly industrialized regions, which do not have the domestic capacity to meet national demand, while the main feedstock suppliers are the countries of East Europe, Latin America, sub-Saharan Africa and East Asia. This results in a mostly international trade, involving movements of large quantities of biofuels and their feedstocks, with significant economic, environmental and social impacts (De Gorter and Just, 2010)

As a consequence, the implications associated with the first generation biofuels production and trade raise several controversial questions, the main of which are related to the "food versus fuel" debate, the exploitation of areas with high carbon stock, the direct and indirect effects in the developing countries, the link between fossil fuels and biofuels prices, the effects of the support policies by governments joined to the protectionist ones, the establishment of sustainability standards and the certification schemes for biofuels. (ICTSD, 2008)

The authors' research aims to analyse the current status of production and trade of the first generation biofuels, at world and European level, and the main concerns about this sector. In particular, in section 2 of this paper an analytical

* Faculty of Economics, Department of Geographical and Commodity Sciences Bari University

review of biofuels and feedstocks, related to their imports and exports, is made. Section 3 analyses several economic, social and environmental drawbacks about the first generation biofuels. A focus on the current EU regulation and support policies is investigated in section 4. Final remarks and considerations are highlighted in section 5.

2. The international biofuel production and trade

2.1. Worldwide biofuels market and trade

The biomass resource has many uses, such as food, feed, fiber, bioenergy (e.g. bio-fuels) and its versatility results in a large international trade in agricultural, industrial wood and forest products, as well as solid and liquid biofuels.

However, the international trade in bio-energy is currently rather limited, but a high rise in the use of bioenergy is expected in regions with limited production potentials, like in the EU, where regulations mandate rising targets for this renewable energy use, above of all for biofuels.

It is well known that the productivity of biomass is higher in the tropical and sub-tropical climates than in the temperate regions where the demand for biomass is growing.

Worldwide production of the first generation biofuel is rapidly increasing in the last years, and reached in 2008 over 65 Million tons (Mt), of which 52 Mt of bioethanol and 13.7 Mt of biodiesel (see Table 1).

A little bit more than 70% of the total biofuels production is represented by bioethanol from Brazil and the USA. Most biodiesel, on the contrary, is produced in the European Union (about 56%), especially by Germany, France, Italy and Spain. At worldwide level, as it is shown in Table 1, the leading biodiesel producers are the EU 27, the USA, Argentina and Brazil.

Table 1 - *Bioethanol and biodiesel production, consumption and net trade by main countries in 2008 (Mt).*

Countries	Production	Consumption	Net trade
Bioethanol			
USA	27	29	-2
Brazil	20	14	6
EU-27	1.8/2.2	2.6/3.7	-0.8/-1.5
-France	*0.7*	*0.7*	-
-Germany	*0.4*	*0.6*	*-0.2*
-Spain	*0.3*	*0.2*	*0.1*
China	1.5	1.7	-0.2
Canada	0.7	1.1	-0.4
Others	0.6/1	1.5/2.6	-0.9/-1.6
World total	*52*	*51*	
Biodiesel			
EU-27	7.7	9	-1.3
-Germany	*2.8*	*2.7*	*2.1*
-France	*1.8*	*2.2*	*-0.4*
-Italy	*0.7*	*0.5*	*0.2*
USA	2.3	1.3	1.0
Argentina	1.1	n.a.	n.a.
Brazil	1.0	0.6	0.4
Indonesia	0.6	0.1	0.5
Malaysia	0.5	0.04	0.46
Australia	0.2	0.8	-0.6
Thailand	0.3	-	0.3
India	0.02	0.3	-0.28
Others		1.36	
World total	*13.72*	*13.5*	

Sources: Authors' elaboration on data (ENERS, 2010) (EurObserver, 2009) (OECD-FAO, 2008) (UEPA, 2009)

As to consumption, the main countries are the USA (29 Mt) and Brazil (14 Mt) for bioethanol, and the EU 27 and the USA for biodiesel, with 9 Mt and 1.3 Mt, respectively.

China is currently the forth larger producer and consumer of bioethanol, as shown in table 1, and in the next future probably it will be much more leader in the biofuel trade.

Among the main biofuels exporters and importers (Table 1), Brazil is the most important exporter of bioethanol produced from sugarcane. The final destinations of Brazilian bioethanol are the EU and the USA.

The exports of biodiesel come from the USA, followed by the EU, Indonesia and Malaysia, and they are destined to some of the European countries, like Italy.

Data of Table 1 indicate that international trade is more consistent for bioethanol than for biodiesel. This is true also for the EU, where the imports are much higher than for biodiesel, not so much in quantity but in volume: indeed the first are in the range from 30% to over 40% of the EU consumption, while the second are only about 15%. In the EU, the largest quantity of bioethanol is imported from Brazil and the USA, while the biodiesel is mainly imported from the USA, Indonesia and Malaysia (ENERS, 2010) (UEPA, 2009).

2.2. Feedstocks use and trade

Concerning the raw materials it is necessary to underline that the world trade is greater than that of biofuels. Table 2 shows the contribution of feedstocks to biofuels production for main countries and worldwide: it emerges that the most important agricultural feedstock, in quantitative terms, is the Brazilian sugarcane, followed by the US cereals, especially maize. In the European Union the main feedstocks are sugar beet and vegetable oils. China uses grains (corn, cassava, rice, etc.) to produce more than 80% of bioethanol.

The high concentration of feedstocks production has been highlighted. In the biofuels market, for instance, Brazil accounts almost for 100% of the sugarcane for bioethanol production and the USA produce 90% of cereals used for the same production. Whilst about 58% of vegetable oils for the biodiesel production is produced by the EU.

Table 2 - *World feedstocks use for bioethanol and biodiesel in 2008 per main countries (Mt).*

	Total Grains	Sugar beet	Sugarcane	Total vegetable oils
EU-27	3.9	6.8	0	6.6
Brazil	0	0	303	0.8
Canada	2.3	0	0	0.05
USA	87.4	0	0	1.9
China	4.3	0	0	0
World	*98*	*6.8*	*306*	*11.5*

Source: (Pfuderer et al., 2010).

The main products used for this production are palm oil, soybean oil and rapeseed oil (Table 3). Soybean, or its oil, and palm oil are imported from Malaysia, Indonesia and Thailand. Within the European Union there is a trade of raw materials, especially rapeseed and/or rapeseed oil (that are cultivated in the EU), concerning some of the European

biodiesel producers, like Italy that imports most of these feedstocks.

Table 3 - *World production, consumption and trade of vegetable oils in 2008 (Mt).*

Vegetable oils	Production	Consumption		Trade
		Food use	Industrial use	
Palm oil	39	31	8	33
Soybean oil	37	33	4	11
Rapeseed oil	18	13	5	4
Others	30	22.5	7.5	n.a.
Total	*125*	*100*	*25*	

Source: (FAO, 2011) (Rosillo-Calle et al., 2009).

Related to the end-use of vegetable oils it is important to underline that worldwide the main part of this quantity is used for the food sector and only a small part (about 8 %) is exploited for the biodiesel production. This percentage is much higher for the EU, where it rises up to 36%. This is true particularly for rapeseed and rapeseed oils, as the production of biofuels has overcome the food use since 2006 and at present it accounts for 60% of the total consumption (Table 4).

Table 4 - *Feedstock consumption levels for different types of biofuels.*

Biofuels	From feedstock	Region	Current feedstock consumption level for biofuels as a share of total feedstock production
Bioethanol	Cereals	EU	1.4%
Bioethanol	Cereals (maize)	USA	20%
Bioethanol	Cereals	World	4.5%
Bioethanol	Sugar-cane	Brazil	50%
Biodiesel	Rapeseed	EU	60%
Biodiesel	Oilseeds	World	5%

Source: (Bauen et al., 2009).

Regarding the cereals consumption level for biofuels the share is 4.5% of the global production (Table 4), because most cereals are used for human consumption or as animal feeds.

However, it should be noted that the rate of increase in cereal use for biofuels is far greater than that for food use. The FAO estimates that out of 55 million tons increase in demand for cereals globally in 2007, only 25 million tons are ascribed to food and feed, so the greater increase went to biofuels (Howarth et al., 2009)

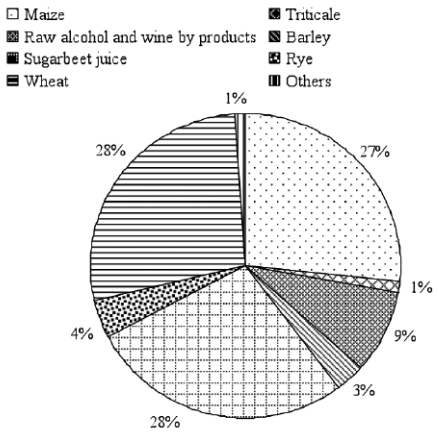
Even if low rate of the total cereals end-use in EU (Table IV) is bound to bioethanol production, Figure 1 shows a marked preponderance of cereals, particularly wheat and maize, respectively 28% e 27%, as feedstock for bioethanol production; among other crops sugarbeet is usually used (28%).

3. Economic, social and sustaimability drawbacks about the international biofuel trade

3.1. Food versus fuel implications

At present worldwide there is no well functioning market for the first generation biofuels, due to several constraints that influence the international trade. In this section the main ones are analysed.

Figure 1 - *Share of EU bioethanol production by feedstock in 2008.*



Source: (Ebio, 2010).

The "food versus fuel" debate regards the increase in food prices, the competition for land and their direct and indirect effects.

Even though most people acknowledge that there is a linkage between food prices and biofuel production, some organizations, such as the European Biomass Association, state that this link has often been overestimated, because the crop prices have little influence on the final product price: wheat, for example, represents less than 10% of the bread price (Larsen et al., 2009).

Indeed the effect of the increase in food price is rather moderate for people living in rich countries, both because food represents only about 10-15% of the consumption and, as mentioned, because the raw material is a relatively small part of the actual food price. But for the poorest households, food accounts for the major part of their consumptions (30-50% or even more in very poor countries) and, as a consequence, directly affects their food security. In other words, the impact of high food prices is more keenly felt by poor people. An example is represented by the protest demonstration held in North Africa at the beginning of 2011.

In developing countries, people who experience the hardest and the most direct impact live in the urban areas in poor countries, because they have no means to produce food by themselves, so they have to pay for food.

Moreover, small farmers in those countries cannot compete with large-scale, export-oriented, intensive productions managed by the industry. Many of them are forced to abandon farming and migrate to cities, increasing the significant fraction of the world population already living in precarious conditions in urban peripheries, extremely vulnerable to the rising of food prices, as said.

To make matters worse the increasing demand for agro fuels often induces small farmers to plant energy crops rather than crops cultivated to meet family needs and/or supply local markets.

In addition to a significant environmental, social and economic damage, the intensification of agriculture and the

displacement of small farmers bring to a dramatic loss of local crop varieties and of the related knowledge, radically undermining the local agricultural sustainability. In the most severe case, it causes the loss of land with high carbon stock, like wetlands or continuously forested areas. The increased demand for cheap biomass to supply the biofuel production may lead to increases in deforestation: the oil-rich species, such as palm oil, are particularly threatened.

Linked to this last concern is the issue related to the competition for land. In fact, agricultural crops compete with each other for productive resources. For example, a given land area can be used to grow maize for ethanol or wheat for bread. When the biofuel demand raises the prices of commodities used as biofuel feedstock, this tends to bid up the prices of all agricultural commodities that rely on the same resource base (Vanwey, 2009). For this reason, producing biofuels from non-food crops will not necessarily eliminate the competition between food and fuel; if the same land and other resources are needed for both food and biofuel feedstock crops, their prices will rise together even if the feedstock crop cannot be used for food. Another effect due to the competition for land is the increase in prices in other sectors connected with agriculture: in order to produce the current amount of corn required in the United States, for example, farmers are growing less soya and wheat, thus increasing their prices. As the grains to feed poultry and livestock become more expensive, so do meat, eggs and dairy.

In the "food versus fuel" debate, the subsidies are important elements. Indeed, several countries have introduced policies promoting the development of liquid biofuels. Much of the government support is supply-side, but it increasingly focuses on the demand side. Governments further complement production subsidies with mandates, setting targets that require certain levels of renewable fuels (ICTSD, 2008)

Different policy instruments and the related kinds of support applied to different stages have very different market impacts. Generally, policies of support directly linked to levels of production and consumption are considered as having the most significant market-distorting effects, while supports to research and development are likely to be the least distorting[1]. Subsidies for research and development, indeed, can expand the range of cost-effective and energy-efficient biofuels; they also stimulate the entry of developing countries into a rising international market.

Even if the production, distribution and storage subsidies[2] are extremely distorting, mandates more greatly affect incentives across the country's industries. By requiring a fixed minimum of renewable fuels, mandates essentially transfer risk from biofuels industry to other industries. While this process ensures the continued use of current biofuels, it inhibits risk-taking and innovation in energy substitutes, and, in the medium and long term, it could make stagnant the production of alternative energy sources with higher demand and viability.

Economically speaking, mandates can be considered as undesirable because they do not explicitly take into account the costs of production. Under certain circumstances, these tools can increase price volatility arising from the supply shocks in agricultural markets; as mandates have to be irrespective of economic circumstances and prices, a part of total crop and biofuels demand becomes unresponsive to crop and oil prices (Pfuderer et al., 2010).

It is important to underline the increasingly strong link between energy and agricultural commodity prices resulting from the growth in demand for biofuels.

Steady high oil prices, in theory, can create a favourable market for biofuels and greater biofuels use can balance oil market and reduce prices markedly. However, it does not happen, because the biofuels use is only a small share of the world energy use in comparison with the oil market. As a consequence, the biofuels sector has a short impact on the crude oil prices. The contrary is true: the biofuels prices, as well as the agricultural feedstocks prices, will tend to be driven by energy prices. This is due to several reasons. First of all, energy is an important input in the production chain of the biofuels, in particular relating to agricultural phase.

In fact fertilisers are derived from natural gas and pesticides are particularly sensitive to energy prices, as well as fuel and heating. These are important farm production costs. For instance, in the case of wheat, maize and barley the related costs of energy represent more than a half of all the operating costs[3] which, in the short term, have more effect on the supply curve for agricultural goods, than the total production costs (Pfuderer et al., 2010).

At the same time, however, agricultural prices can not increase faster than energy prices or they themselves may leave the market of energy, thus agricultural prices will tend to be driven by energy prices, as said. If oil prices remain high, vulnerable people will be those in countries that have chronic food shortages and import oil (FAO, 2008). So this risk is still higher for the low income countries that are, in most cases, net importers of oil (in 2005 most of the 82 low income countries with food deficit were also net oil importers).

3.2. Sustainability certifications

The relationship between biofuels and sustainable development is complex and differentiated. It would be really important to establish sustainability standards and certification schemes for biofuels, as demanded by many people. Nevertheless, there are several issues about this matter.

[1] In the USA federal and state governments have provided a variety of other special tax credits, incentives and direct subsidies to the biofuel industry. Brazil offers various tax incentives to bioethanol production. As regards biodiesel, a Social Fuel Seal has been introduced taking into account the agro ecological potential for biodiesel feedstocks production and regional social inequalities. Through this, it is possible to benefit from tax exemption on biodiesel produced according to sustainable principles, as certified by the Social Fuel Seal.

[2] It should be noted that fossil fuels also receive substantial direct and indirect subsidies. UNEP estimates that worldwide subsidies for energy might amount to 300 billion dollars per year (Bringezu et al., 2009).

[3] The energy costs as proportion of total operating costs is very high for wheat (60%), maize (56%), barley (54%), followed by rice (45%) and more lower for soybean (29%) (Pfuderer et al., 2010).

Due to the different uses of biomass (food, feed and fibre), it is complicated to require compliance with sustainability criteria for only one final use (biofuels). Moreover, a certification scheme established on the basis of the final use of a crop might be highly ineffective in securing sustainability concerns. Applying a double standard policy between biofuels and the other mentioned uses is very likely to lead to indirect displacement effects. Only a certification scheme addressing biomass feedstock production (cultivation) regardless of the final use would avoid different impacts, either direct or indirect (Scarlat et al., 2011).

Other aspects to considerer about biofuels sustainability are the indirect effects. Biomass is a part of large commodity markets with complex interactions within the markets. Therefore, the main strategy to prevent indirect effects could consist in revealing a link between local feedstock production and the change in land use occurring elsewhere. Preventing indirect effects, in fact, requires a monitoring system focusing on the effects of biofuels at global level and based on indicators of the economic, environmental and social performance, in relation to other issues, such as increased food-feed demand due to changes of the diet, rise prosperity in developing countries and population growth.

A number of certification initiatives would certainly lead to a beneficial competition, resulting both in the improvement in standards and the implementation of the verification tools. However, the development of numerous certification schemes could result in inconsistent certification schemes with loose performance parameters. In all likelihood the proliferation of standards, by creating more confusion, would lead to lower confidence among various stakeholders and finally to reduce acceptance among the customers. The lack of a uniform certification scheme, on the contrary, could increase costs and a high administrative burden. In any case, the implementation and the quality of the control of the certification schemes will be a crucial issue in the years to come (Ruddy et al., 2009).

3.3. Logistical constraints

Further barriers to the international trade of biofuels are related to logistical and economic points of view. There is a link between these two aspects. Notwithstanding most of bioenergy feedstocks presents difficulties of transport and high relative costs, this is less true for liquid biofuels, thanks to their relatively high energy density (Childs and Bradley, 2007). Particularly, the international trade by ship is feasible in terms of energy balance and transportation costs, although it can be affected by the availability of suitable cargo boat and other problems.

The local transport by truck is more expensive both for energy and economic reasons. This aspect, linked with the lack of adequate infrastructures, conditions the production and transport and the relative costs in developing countries.

In Latin America infrastructure remains a primary barrier to biofuels development in the region. Many countries of this region continue to suffer from broken down and underdeveloped infrastructure, despite favourable agricultural and political conditions. This affects bioenergy sector competitiveness, due to the risen transport costs that exceed tariffs and export costs across the region. Waterways and ports, when available, could be used and developed as essential links in the biofuels logistic chain.

4. Focus on the EU biofuels sector

4.1. The European Union regulation

The European regulations, about the use of renewable energy sources, incentive the use of biofuels as a feasible tool for achieving the EU environmental policy on the transport sector and for securing and diversifying the energy supply but, at the same time, provide strict sustainability criteria for the worldwide trade concerning biofuels and their feedstocks, particularly the first generation ones (Paiano et al., 2010).

The Directive 2009/28/EC provides for the basic regulation of the entire package of measures to increase the use of energy from renewable sources, the energy savings and the energy efficiency. As enhancement of these measures the Directive 2009/29/EC and particularly the Directive 2009/30/EC, regarding the specification of fuels and their monitoring and reduction of the greenhouse gas emissions, have been enacted.

Notwithstanding the mandatory target of 10% provided by the Directive 2009/28/EC is technically achievable by domestic production, it should be likely that this target is met through a mix of domestic and foreign production of biofuels and their raw materials, in order to secure a long-term and sustainable supply and demand of bioenergy (Ruddy and Zah, 2009).

For this purpose Member States may agree and make arrangements for the statistical transfer on a specific amount of energy from renewable sources from one Member State to another Member State.

Without considering whether the agricultural feedstocks were cultivated inside or outside the territory of the Community, however, energy from biofuels and bioliquids shall fulfil the sustainability criteria. Some of these criteria are the following: a) the greenhouse gas emission savings from the use of biofuels and bioliquids shall be at least 35%. Savings shall be at least 50% from 1 January 2017 and at least 60% from 1 January 2018 for the biofuels production started on or after 1 January 2017; b) biofuels and bioliquids shall not be made from raw materials obtained from land with high biodiversity value, and/or from land with high carbon stock. There is in fact a concern that production of biofuels in some third countries might not respect the lowest environmental or social requirements. It is therefore important to develop multilateral and bilateral agreements, as well as voluntary international or national schemes that deal with relevant environmental and social issues, in order to carry out the production of biofuels worldwide in a sustainable way. In the absence of mentioned agreements or schemes, Member States should require economic operators to report to these topics.

The economic operators shall submit reliable information and make available to the Member State, on request, the data that were used to develop the information. Member States shall require economic operators to arrange for an adequate standard of independent auditing of the information submitted, and to provide evidence that this has been done.

The auditing shall verify that the systems used by economic operators are accurate, reliable and protected against fraud. It shall evaluate the frequency and methodology of sampling and the robustness of the data.

To meet these requirements, the Commission, from 2012 and every two years, shall report to the European Parliament and the Council on national measures taken to respect the sustainability criteria. This is to comply with both the third countries and the Member States that are a significant source of biofuels (or their raw materials) consumed within the Community.

Moreover the Commission shall report on the influence of increased demand for biofuel on social sustainability in the Community and in third countries, and on the impact of Community biofuel policies on the availability of low prices for foodstuffs, particularly in the developing countries. Reports shall address the respect of the land use rights and they also state whether the country, Member State or third country, has ratified and put into practice the main Conventions of the International Labour Organisation.

4.2. Support Policies

In order to support the production and consumption of biofuels, European countries, as in the rest of the world, usually adopt a mix of various policy regulations and measures. These measures affect various stages of the production and use of bioenergy: for example, biomass production and/or conversion, bioenergy distribution and final consumption. Some of the typical support measures adopted are direct subsidies per output of biomass, mandatory rates for biofuels, guaranteed prices for biofuels, reduction of distribution costs and excise tax exemptions for biofuels (IEA, 2010). While tax exemptions represent a means for stimulating the demand for biofuels, tariffs are used to stimulate the domestic production and to protect domestic biofuel industries (FAO, 2008).

4.2.1. Import duties and trade policies

Member countries of the EU have also adopted a broad range of tariffs and other border measures.

The EU, the USA and others have imposed import duties and other restrictions on foreign bioethanol, biodiesel and their agricultural inputs, but both the EU and the USA offer preferential market access to developing countries by way of unilateral tariff reductions that stimulate imports of certain agricultural commodities and biofuels.

As regards to *bioethanol imports*, according to the European Commission, 45% of the ethanol imported by the EU in 2005 was under the normal MFN (Most Favoured Nations) regime, 29% under reduced duty regimes and 26% of the imports had no duties. (Walter et al., 2007)

Under the MFN regime the EU imposes a duty of € 0.192 per litre on undenatured alcohol, while for denatured alcohol (ethanol with additives) the duty is € 0.10 per litre; the standards import tariff for MFN is equivalent to a 63% ad valorem tariff, but several developing countries have preferential access (Oosterveer and Mol, 2010).

[4] This tariff has been temporarily waived since 2006.

The EU imports from Brazil, that are about 25% of the total EU bioethanol imports, are under MFN rules; but new rules are expected within the Mercosur-EU agreement whose negotiations are still ongoing (Vos et al., 2010).

Reduced duty and duty-free regimes correspond to preferential trade arrangements between the EU and developing and less developing countries.

Many countries of Africa, South and Central America and Asia are included in these preferential trade arrangements that aim at drug diversion, sustainable development and good governance. About ethanol, the EU has much more preferential trade regimes than the USA.

Currently, in fact, bioethanol enters the EU duty-free under the Everything But Arms initiative (EBA) for Least Developed Countries and the Cotonou Agreement with African, Caribbean and Pacific (ACP) countries.

The United States charge a 2.5% ad valorem tariff plus an additional € 0.096 per litre "secondary" duty on ethanol intended to be used as a fuel. The exemption to the import duties of additional charge of ethanol is applied to the least developed countries according to the GSP (Generalized Systems of Preferences) status, to the Caribbean and Central America countries (CBI agreement), ATPA (Andean Trade Preference Act) countries, Canada, Israel and Mexico (Doornbosch and Steenblik, 2007) (Walter et al., 2007).

Brazil is currently the largest ethanol exporter to the EU and the USA, under MFN rules, as above mentioned, but bioethanol enters the USA duty free via the Caribbean Basin Initiative (CBI). Brazil, whose imports are much lower than exports, applies an official import tariff of 20% ad valorem on both undenatured and denatured ethanol[4], in order to open up the international biofuels trade (Worldwatch Institute, 2007).

Biodiesel European imports are also taxed at varying rates due, in part, to the different feedstock used. It is subject to much lower import tariffs than ethanol; these tariffs range from 0% in Switzerland to 6.5% in the EU. In addition, these conditions apply only to the import of the biodiesel itself (as FAME, Fatty Acid Methyl Ester), not to the import of raw materials such as tallow or used cooking oil. The oilseeds global trade, particularly soybeans, is relatively unrestricted by tariffs and other border measures; however, oilseed meals, and particularly vegetable oils, have higher tariffs (Worldwatch Institute, 2007).

The European biodiesel market, as said, is protected by a relatively low ad valorem import tariff of 6.5% (Doornbosch and Steenblik, 2007). For vegetable oils destined to technical or industrial uses the rate is even lower (3.2 to 5.1%).

To let up on rapeseed oil production, European biodiesel producers have started to get feedstock from foreign sources. So, oilseeds such as soybeans enter duty free and duties on palm oil from the main exporters (Indonesia and Malaysia) are low, ranging from 0 to 3.1% (Oosterveer and Mol, 2010).

In July 2009 (The Council of the European Union, 2009 x, y) antidumping and countervailing duties were imposed on the imports of biodiesel from the United States of America. This measure has been stimulated by the complaint lodged by the European Biodiesel Board and after an investigation by the

European Commission Services. Then, since late 2006, the European Commission has established that the European market has been severely affected by the imports of highly subsidised biodiesel from the USA. In this country each gallon of biodiesel blended with mineral diesel is subsidised by € 0.72, therefore a US biodiesel producer can receive up to € 216 per ton[5]. This is worth for any blend, without limitations in terms of biodiesel content, as a "B99.9", that is blend of biodiesel for 99.9% and only 0.1 % of fossil diesel. This benefit is not limited to biodiesel domestic consumption, but it is also extended to its exports.

As a consequence it is expected that it will largely reduce the amount of EU biodiesel imports from the United States.

While EU biodiesel producers will benefit from the decrease in the US exports, other countries exporting biodiesel, such as Argentina, Indonesia, Malaysia and Canada, are also expected to benefit from this situation (Flach et al., 2009).

In the USA trade barriers for biodiesel do not exist, but groups of interest (the American Soybean Association, for example) are pressing Congress to impose a tariff.

As regards Brazil, in 2004 the National Biodiesel Production Program, similar to its ProAlcohol program for ethanol, has been launched. As a starter on the biodiesel market, Brazil applies an import tariff of 14%, much higher than the USA and the EU.

Another relevant difficulty affecting the biofuel trade concerns their classification.

The identification and the trade classification of a product is very important to determine the tariff level and eventual subsides could be applied. The current classification of biofuels is unclear and not aligned with the consumer market, because there are too many international trading rules applied to different stakeholders involved in the biofuels sector.

Before 2005, biodiesel and bioethanol have been traded as agricultural products. In 2005 the World Customs Organization decided to consider biodiesel as an industrial product, putting it in the Section VI on "products of chemical and allied industries" (HS 382490). Bioethanol was and is still traded as an agricultural good, under HS 2207 in Chapter 22 on "beverages, spirits and vinegar". Only fuel ethanol, being pre-blended with petrol, is classified separately under heading 3824 and charged a normal customs duty of around 6 percent. This different classification has relevant implications about the WTO rules on tariff rates and subsidies can be applied to these biofuels, with a more favourable deal for biodiesel (ICTSD, 2008) (IPC and REIL, 2006).

4.2.2. Tax exemptions and support measures

In addition to providing border protection, several countries have adopted other policy regulations and measures to support the biofuels production and use. The production of biofuels in the EU is also heavily subsidised.

Among the measures adopted to stimulate and promote the use of biofuels a EU Directive regarding Tax Relief applying to Biofuels (2003/96/EC) was issued in 2003, permitting all member countries to grant excise tax exemptions as biofuel production becomes more widespread within Europe.

Today, most of the EU Member States have introduced exemptions at various levels up to 100% for biofuels produced or blended within European countries.

Italy currently provides tax exemptions for an annual quota of about 200,000 tonnes of biodiesel during the period 2005-2010, as well as reduced excise duties on bioethanol and related bio-derived additives.

Germany is one of the few countries with excise tax privileges provided to the 2nd generation biofuels, under the Biofuels Quota Act, 2006 (Sims et al., 2008),

Germany and Italy have also incorporated a measure that allowed adjustments to be made in the case of over-compensation.

It should be underlined that the support measures were not always effective in all EU Member States. In several EU countries, like Italy, the short measures assumed to incentive the biofuel market, in spite of the EU directives that rise the biofuel targets consumption, have led to an overcapacity of the biofuels plant production and then to higher fixed costs, with negative consequences on the profitability. This ends up to affect the entire EU sector[6] and it can be a restraint to the development of biofuels sector.

5. Final remarks and considerations

This paper reports on the state of the international and European current trade of biofuels of the first generation. An analysis about the main constraints affecting this sector, with a focus on the EU sector, has also been made.

As regards the problem of the rise in prices due to the competition for land between the crops grown for bioenergy and those grown for food, farmers could also rotate food and energy crops, but their choice is highly dependent on relative prices fetched on the market. Thus, under the current situation, food production is alternative to biofuel production. In the future, a well designed modern biofuel system may stimulate local food production (for example, if leguminous nitrogen fixing crops for biofuels are rotated with cereals, the overall productivity of the system could be enhanced) (AA. VV., 2006).

In any case, increase in farm productivity and extension of production on marginal land, will be fundamental in preventing long-term increases in food prices, together with the negative environmental effects associated to the change in land use.

Concerning the support policies used in many countries to promote the biofuel sector, it is important that the subsidies are applied in a way that does not distort trade, harm the environment or disadvantage developing countries. Otherwise the development and the benefits of energy diversification could be significantly enhanced if biofuel trade were liberalized. In fact, such trade is currently limited because of the protectionist policies of domestic producers. Liberalization would allow the most efficient producers to expand operations beyond their borders and it would also promote more efficiency and con-

[5] The exchange rate is 1$ = 0.72 ⇔at 02.02.2011

[6] The gap between the productive capacity of the EU plants of biodiesel (16 Mt) and the relative production (7.7 Mt) is very high, about twice.

tribute to lower price, allowing a greater diversification worldwide (Nylund et al., 2008).

It is necessary also to underline that a system based on a well identified standard, both for biodiesel and bioethanol, must be created worldwide. Hence, the alignment of the current regulation about these trading issues is a fundamental task for the governments involved, assuming that the trade of biofuels or their feedstocks will probably be increasing in the next period.

This is particularly important for those European Member States, like Italy, whose imports are not a contingent condition, but a structural one, owing to their agricultural features and land availability. The first matter is connected to the yield of some feedstocks suitable for biofuels production (as palm or sugarcane) that is much higher in the tropical countries than in the European ones; the second matter regards the land area to cultivate the biofuel crops, that is rather limited in the EU, partly due to the strong competition with food crop chain. On the other hand it is important to underline that a global competition for arable land already exists globally for agro-food production: it is known that several countries, like China, have made trade agreements to cultivate some crops on foreign territories, such as those in Africa, to satisfy their own domestic needs.

Therefore, it could be necessary to decouple the future production of biofuels from the land competition and try to rely more and more on residual materials (Paiano et al., 2011).

Moreover, it should be important to lay stress on the studies and analysis of the assessment of the environmental, social and economic impacts of the entire life cycle of biofuels (the first generation as well as the next ones), including the international transport, in order to avoid that perspectives of business deal could affect the real sustainability of this sector. About these issues, adequate certifications, the adoption and respect of quality norms and sustainability criteria, that are currently adopted only in some countries (e.g. the latest EU Directives), must be well established.

But, the additional measures to ensure sustainability of biofuels and/or bioenergy certification could determine other non-tariff drawbacks for developing countries, whose production costs of feedstocks, currently low, could be increasing, due to the necessity to conform their productions to the mentioned sustainability criteria and quality certifications. Moreover, the complexity of these approaches bears the risk that small producers in developing countries will be locked out and the market for sustainable biofuels will be dominated by international investors and large–scale plantations.

These considerations about some of the different and numerous concerns about this international trade show how important can be the role of WTO for making its rules more clear in a way that both developed and developing countries can create a suitable biofuels sector to reach a greater economic growth.

Furthermore it should be underlined that the global biofuel trade described in this note will be changed in the future by the role of the emerging countries, like China, India and some Southeast Asian nations, that are rapidly expanding their biofuel production and use, because of the concerns about oil, particularly about its security of supply and high costs. This issue, joint to the high economic growth rates of these countries in recent years (above all the Chinese one), as well as the mandatory targets of biofuels that have been provided (China 15% by 2020, India 20% by 2012) (Thurmond, 2011), boosts an international approach and a further global monitoring of the trade of the first generation biofuels.

References

AA. VV., 2006. *An introductory guide for assessing the potential of biofuels in developing countries*, USAID (United States Agency International Development), 35 pagg.

Bauen A., Berndes G., Junginger M., Londo M., Vuille F. et al., 2009. *Bioenergy - A sustainable and reliable energy source. A review of status and prospects*, IEA (International Energy Agency) Bioenergy, 107 pagg.

Bringezu S., Schütz H., O'Brien M., Kauppi L., Howarth R.W., McNeely J., 2009. *Towards sustainable production and use of resources: Assessing Biofuels*, UNEP (United Nations Environment Programme), 118 pagg.

Childs B., Bradley R., 2007. *Plants at the Pump: Biofuels, Climate Change, and Sustainability*, World Resources Institute, Washington, ISBN: 978-1-56973-670-8.

De Gorter H., Just D.R., 2010. *The Social Costs and Benefits of Biofuels: The Intersection of Environmental, Energy and Agricultural Policy*, Applied Economic Perspectives and Policy, 32, 1, 4-32.

Doornbosch R., Steenblik R., 2007. *Biofuels: is the cure worse than the disease?,* in *Round Table on Sustainable Development*, OECD (Organisation for Economic Co-operation and Development), 11-12 September 2007, Paris, 57 pagg.

Ebio (European Bioethanol Fuel Association), 2010. *The EU market – Production and consumption*, http://www.ebio.org/, last access April 2010.

ENERS Energy Concept, 2010, *Biofuels Platform*, www.biofuels-platform.ch/accueil/index.php, last access February 2011.

EurObserv'er, 2009. *Baromètre Biocarburant* in Systèmes Solaires – Le journal des energies renouvelables, 192, 55-77.

FAO (Food and Agriculture Organization of the United Nations), 2008. *The state of food and agriculture*, FAO, Rome, 129 pagg.

FAO (Food and Agriculture Organization of the United Nations), 2011. On-line database of FAOSTAT, http://faostat.fao.org/, last access February 2011.

Flach B. et al., 2009. *EU-27 Biofuels Annual Report 2009*, USDA Foreign Agricultural Service and GAIN (Global Agricultural Information Network).

Howarth R. W., Bringezu S., Martinelli L.A., Santoro R., Messem D., Sala O.E., 2009. *Introduction: Biofuels and the Environment in the 21st Century*, in Howarth R.W and Bringezu S. (eds) *Biofuels: Environmental Consequences and Interactions with Changing Land Use*, Proceedings of the Scientific Committee on Problems of the Environment (SCOPE,) International Biofuels Project Rapid Assessment, 22-25 September 2008, Gummersbach, Germany, pag. 15-36; http://cip.cornell.edu/biofuels/, last access January 2011.

ICTSD (International Centre for Trade and Sustainable Development), 2008. *Biofuel Production, Trade and Sustainable Development*, ICTSD, Geneva, 84 pagg.

IEA (International Energy Agency), 2010. *Sustainable Production of Second-Generation biofuels. Potential and perspectives in major economies and developing countries*, OECD (Organisation for Economic Co-operation and Development) / IEA (International Energy Agency), pag. 221.

IPC (International Food & Agricultural Trade Policy Council), REIL (Renewable Energy and International Law), 2006. *WTO Disciplines and Biofuels: Opportunities and Constraints in the Creation of a Global Marketplace*. IPC, Washington, 44 pagg.

Larsen U., Johansen T., Schramm J., 2009. *Ethanol as a fuel for road transportation*, IEA – AMF (Implementing Agreement on Advanced Motor Fuels) and DTU (Technical University of Denmark), 100 pagg.

Nylund N.O., Aakko-Saksa P., Sipilä K., 2008. *Status and outlook for biofuels, other alternative fuels and vehicles*, VVT, 161 pagg.

OECD (Organisation for Economic Co-operation and Development) - FAO (Food and Agriculture Organization of the United Nations), 2008. *Agricultural Outlook 2008-2017*, OECD Publications, Paris, 73 pagg.

Oosterveer P., Mol A.P.J., 2010. *Biofuels, trade and sustainability: a review of perspectives for developing countries*, Biofuels Bioproducts & Biorefining, 4, 66-76.

Paiano A., Camaggio G., Lobefaro L., 2010. *Scenari per la bioenergia alla luce della nuova direttiva UE*, ACQUA & ARIA, 41, 1, 28-32.

Paiano A., Camaggio G., Lagioia G., 2011. *Territorial level for biofuel production-Case study of an Italian region*, Renewable and Sustainable Energy Review, 15, 2222-2231.

Pfuderer S., Davies G., Mitchell I., 2010. *The role of demand for biofuel in the agricultural commodity price spikes of 2007/08*, Food and Farming Analysis-Defra (Department for Environment Food and Rural Affaires), 72 pagg., http://www.defra.gov.uk/foodfarm/food/pdf/ag-price-annex%205.pdf, last access February 2011.

Rosillo-Calle F., Pelkmans L., Walter A., 2009. *A global overview of vegetable oils, with reference to biodiesel*, IEA Bioenergy Task 40, 89 pagg.

Ruddy T. F., Zah R. Guest Editors, 2009. *Special Issue: International Trade in Biofuels*, Journal of Cleaner Production, 17, S1-S108.

Scarlat N., Dallemand J.-F., 2011. *Recent developments of biofuels/bioenergy sustainability certification: A global overview*, Energy Policy, in press.

Sims R., Taylor M., Saddler J., Mabee W., 2008. *From 1st to 2nd generation biofuel technologies – An overview of current industry and RD&D activities*, OECD (Organisation for Economic Co-operation and Development) / IEA (International Energy Agency) – GBEP (Global Bioenergy Partnership), Paris.

The Council of the European Union, 2009 x. *Council regulation (EC) No 598/2009 of 7 July 2009 imposing a definitive countervailing duty and collecting definitively the provisional duty imposed on imports of biodiesel originating in the United States of America*, Official Journal of the European Union L. 179, 1-25.

The Council of the European Union, 2009 y. *Council regulation (EC) No 599/2009 of 7 July 2009 imposing a definitive anti-dumping duty and collecting definitively the provisional duty imposed on imports of biodiesel originating in the United States of America*, Official Journal of the European Union L. 179, 26-51.

Thurmond W., 2011. *Algae 2020: Algae Biofuels Demand Drivers, Players, Business Models, Markets & Commercialization Outllok*, Vol. 2, Emerging Markets Online, 385 pagg.

U.E.P.A. (European Union of Ethanol Producers), 2009. *GT Trade 13/09*, Brussels, www.uepa.be/attachments/module_news/40_TRADE13-09.doc, last access February 2011.

Vanwey L., 2009. *Social and distributional impacts of biofuel production*, in Howarth R.W and Bringezu S. (eds) *Biofuels: Environmental Consequences and Interactions with Changing Land Use*, Proceedings of the Scientific Committee on Problems of the Environment (SCOPE), International Biofuels Project Rapid Assessment, 22-25 September 2008, Gummersbach, Germany, 205-214, http://cip.cornell.edu/biofuels/, last access January 2011.

Vos J., Thebaud A., Roelofs S., 2010. *Assessment of barriers to the trade of biofuels between the European Union and Latin America*, BTG (Biomass Technology Group), 57 pagg.

Walter A., Rosillo-Calle F., Dolzan P.B., Piacente E., da Cunha K.B., 2007. *Market evaluation: fuel ethanol*, in *Task 40 Sustainable bio-energy trade; securing supply and demand*, IEA Bioenergy, 75 pagg.

Worldwatch Institute, 2007. *Biofuels for transport. Global potential and implications for sustainable energy and agriculture*, BMELV (German Federal Ministry of Food, Agriculture and Consumer Protection), 452 pagg.

This work is the result of the authors' commitment. Particularly, the sections 1, 2, 3, 4 and reference collection are ascribed to Annarita Paiano; the sub-section 4.1 and the section 5 to Gigliola Camaggio; reference collection, figure and table elaboration of section 2 to Leonarda Lobefaro.