

CONCERNS ABOUT THE GLOBAL TRADE OF THE FIRST GENERATION BIOFUELS

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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 in the development of common schemes to authenticate that the origin of biofuels and/or raw materials is 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. In this first note the recent evolution of the global trade of these biofuels, as well as its drawbacks, has been examined.

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Riassunto

Le implicazioni associate al crescente commercio dei biocombustibili e delle relative materie prime sono varie e diversificate a livello mondiale.

Le principali sono legate al dibattito “alimenti versus combustibili”, allo sfruttamento di aree caratterizzate da un elevato stock di carbonio, agli effetti diretti e indiretti nei PVS, alla relazione tra i prezzi dei combustibili fossili e quelli dei biocombustibili, agli effetti delle politiche di supporto adottate dai governi e alla definizione di standard di sostenibilità e schemi di certificazione per i biocarburanti. In questo senso, le preoccupazioni espresse dalle organizzazioni internazionali nello sviluppo di comuni schemi per autenticare che l'origine dei biocarburanti e/o delle materie prime soddisfi determinati requisiti, come la conservazione e la protezione degli ecosistemi.

Con questa ricerca gli autori si propongono di descrivere lo stato attuale della produzione e del commercio del biodiesel e del bioetanolo, i cosiddetti biocarburanti di prima generazione, e le varie preoccupazioni economiche, sociali e ambientali che caratterizzano il settore. In questa prima nota sarà esaminata la recente evoluzione del mercato mondiale di questi biocarburanti, mettendone in evidenza anche i principali aspetti negativi.

Keywords: international trade, biofuels, sustainability criteria.

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 improving the environment and increasing 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 (1).

For this reason most OECD countries have developed policies of subsidisation and protection in 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 (see Table 1) (2).

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 protectionist ones, the establishment of sustainability standards and the certification schemes for biofuels (1, 3).

The authors’ research, shared in two notes, aims to analyse the current status of production and trade of the first generation biofuels and the main concerns about this sector.

The first note focuses the attention on this sector globally by examining the trade of these biofuels, as well as its drawbacks; in the second one both the aspects of the European and Italian production and trade, and the main support policies are examined.

In particular, in the section 2 of this paper an analytical review of biofuels and feedstocks, related to their imports and exports, has been made. The section 3 has analysed the several economic, social and environmental drawbacks about the first generation biofuels. Finally, the conclusive remarks and considerations have been underlined in the section 4.

The International Biofuel Production and Trade

Biomass is a resource that has many uses, such as food, feed, fiber, bioenergy (e.g. bio-fuels).

Its versatility results in a large international trade in agricultural, industrial wood and forest products, as well as solid and liquid biofuels (see Table 1).

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

In particular the production of the first generation biofuel is rapidly increasing in the last years, to reach in the 2008 over 65 Million tons (Mt), of which 52 Mt of bioethanol and 13.7 Mt of biodiesel (see Table 2).

A little bit more than 70% of the total biofuels production is represented by the bioethanol from Brazil and the USA. The most biodiesel (about 56%), on the contrary, is produced in the European Union, especially by Germany, France, Italy and Spain. At worldwide, as it is shown in Table 2, the leading biodiesel producers are the EU 27, the USA, Argentina and Brazil.

TABLE 1
AN OVERVIEW OF THE WORLD PRODUCTION AND TRADE
OF BIOMASS IN 2008 (MT)

Product	Production (a)	Trade (b)	b/a (%)
<i>Industrial wood and forest products</i>	2,361	392	17
<i>Agricultural products</i>			
Maize	823	103	12
Wheat	690	131	19
Barley	158	27	17
Oats	26	3	12
Rye	18	1	6
Rice	685	2	-
Rapeseed	58	16	27
Soybean	231	79	34
<i>Solid and liquid biofuels</i>			
Fuel wood	757	1.9	-
Charcoal	49	1.8	4
Ethanol	52		
Biodiesel	13.72		

Sources: Authors' elaboration on data (4-5)

As regards 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.

TABLE 2

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
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
<i>World total</i>	<i>52</i>	<i>51</i>	
BIODIESEL			
EU-27	7.7	9	-1.3
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	
<i>World total</i>	<i>13.72</i>	<i>13.5</i>	

Sources: Authors' elaboration on data (4, 6-8)

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

Among the leading biofuels exporters and importers (Table 2), Brazil is the most 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 2 indicate the international trade is more consistent for bioethanol than biodiesel.

Concerning their raw materials it is necessary to underline that the world trade is greater than the biofuels one. Table 3 and Figure 1 show the contribution of feedstocks to biofuels production per 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 use grains (corn, cassava, rice, etc.) to produce more than 80% of bioethanol.

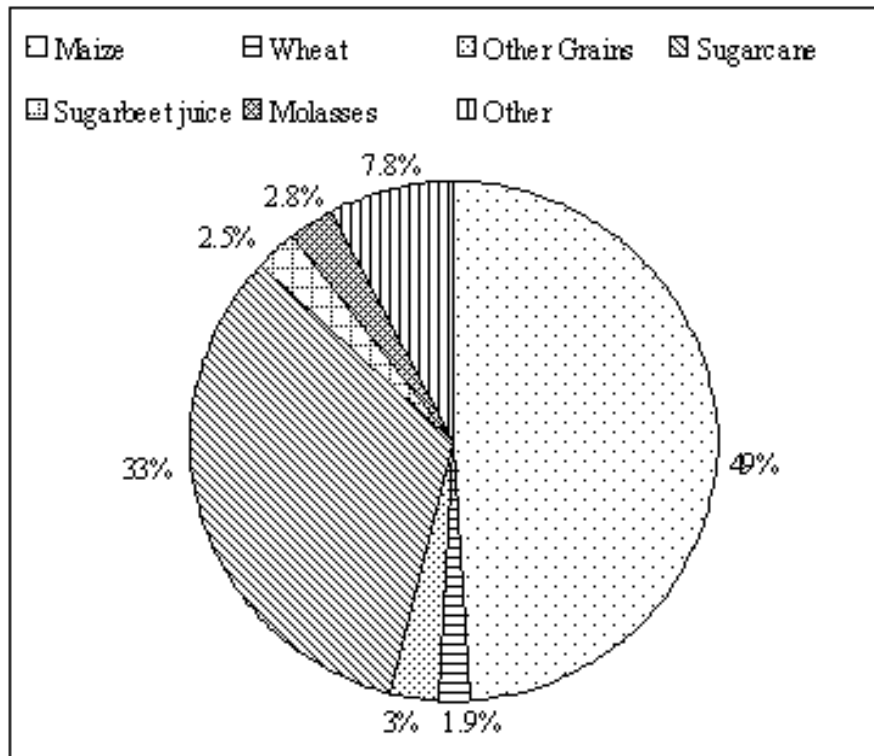
By these data the high concentration of feedstocks production emerges. In the biofuels market Brazil accounts almost 100% of the sugarcane for bioethanol production and the USA produce 90% of cereals used for the same production. Whilst the EU produces about 58% of vegetable oils used for biodiesel production.

TABLE 3

**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
<i>World</i>	<i>98</i>	<i>6.8</i>	<i>306</i>	<i>11.5</i>

Sources: (9)



Source: (9)

Fig. 1 - Share of world bioethanol production by feedstock in 2008.

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

Particularly palm oil, soybean oil and rapeseed oil are the main products used for biodiesel production (Table 4). 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 the most of these feedstocks.

TABLE 4

**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.
<i>Total</i>	<i>125</i>	<i>100</i>	<i>25</i>	

Source: (5, 10)

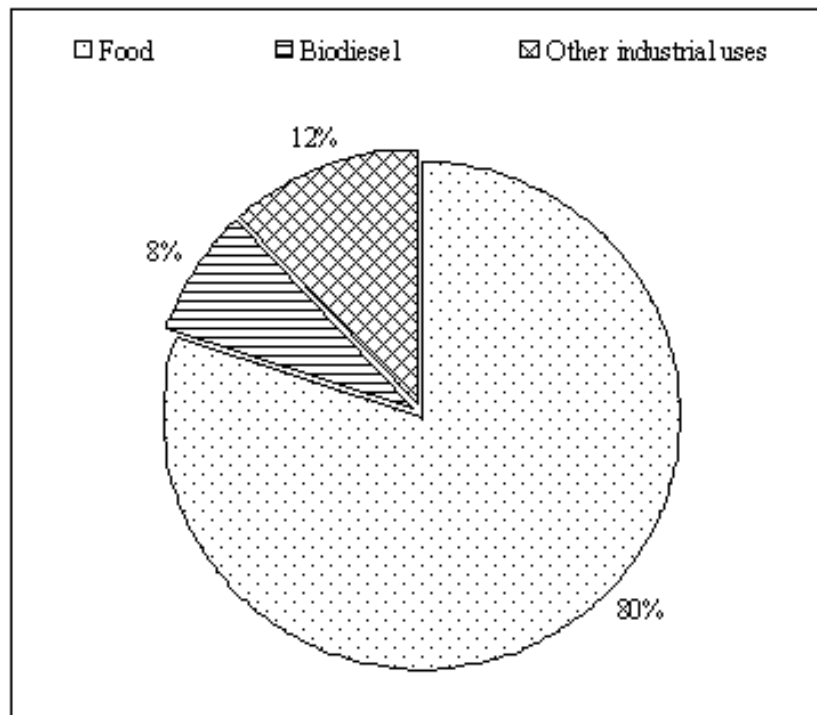
Related to the end-use of vegetable oils it is important to underline that worldwide the main part of this quantity is used for food sector and only a small part (about 8 %) is exploited for the biodiesel production (Figure 2).

This percentage is much higher for the EU, where it rises to 36%.

This is true particularly for rapeseed and rapeseed oils, for which the production of biofuels has overcome the food use since the 2006 and at present it accounts 60% of the total consumption (Table 5).

Regarding the cereals consumption level for biofuels the share is 4.5% of the global production (Table 5), that is the most cereals have been used for human consumption or for 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. FAO estimates that the 55 million tons increase in demand for cereals globally in 2007, only 25 million tons was ascribed to food and feed, so the greater increase went to biofuels (11).



Source: (10)

Fig. 2 - World vegetable oils end-use in 2008.

TABLE 5

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: (12)

Economic, Social and Sustainability Drawbacks about the International Biofuel Trade

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.

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

Even though the great deal of people acknowledge that there is a linkage between food prices and biofuel production, some organizations, 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 (13).

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 poor people more keenly feel the impact of high food prices. An example of it is represented by the protest demonstration held in North Africa at the beginning of the 2011.

In the developing countries, the 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 to have pay for food (13).

Moreover, small farmers in those countries cannot compete with large-scale, export-oriented, intensive productions managed by industry. Many of them are forced to abandon farming and migrate to cities, increasing the significant fraction of 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 agrofuels often induces small farmers to plant energy crops rather than cultivate crops 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 (14). 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 feedstocks, this tends to bid up the prices of all agricultural commodities that rely on the same resource base (15).

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 raise 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 (1).

Different policy instruments and the related several 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.

Subsidies for research and development, indeed, can expand the range of cost-effective and energy-efficient biofuels, as well as stimulate the entry of developing countries into a rising international market.

Production, distribution and storage subsidies¹ are extremely warped, but 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 stagnate the production of alternative energy sources with higher demand and viability (1).

Economically speaking, mandates can be considered as undesirable because they do not explicitly take into account the costs of production. Under certain circumstances, mandates 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 (9).

It is important to underline the increasingly strong link between energy and agricultural commodity prices resulting from the growth in demand for biofuels (17).

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. It is true the contrary: the biofuels prices, as well as the agricultural feedstocks ones, 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 which, in the short term, have more effect on the supply curve for agricultural goods, than the total production costs (9).

At the same time, however, agricultural prices cannot increase faster than energy prices or they will price themselves out of the energy market. 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

¹ It should be noted that fossil fuels also receive substantial direct and indirect subsidies. UNEP estimates that worldwide subsidies for energy might amount 300 billion dollars per year (16)..

that have chronic food shortages and import oil (17). So this risk is still higher for the low income countries that are, in the most case, net importers of oil (in 2005 most of the 82 low income countries with food deficit were also net oil importers).

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 (1). Nevertheless there are several issues about this matter (18).

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 (18).

Other aspects to consider 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 (19). 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 with 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 (18, 20).

Logistical and trade classification 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 the 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 (21). 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.

Another relevant difficulty affecting the biofuel trade concerns their classification.

The classification of a product is very important to determine the tariff level and the eventual subsidies which could be applied. The current classification of biofuels is unclear and not aligned with the consumer market, because there are several international trading rules applied to different parts of the biofuels sector.

Conclusive Considerations

This paper reports on the state of the international trade of biofuels of the first generation. An analysis about the main constraints affecting this 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. However the farmers' 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) (22).

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 (17).

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 contribute to lower price, allowing a greater diversification worldwide (23).

Finally it is necessary to underline the need to create a system based on a well identified standard, both for biodiesel and bioethanol, worldwide recognized, together with adequate certifications, that currently are adopted only in some countries: certifications about the adoption and respect of quality norms, as well sustainability criteria, as for the latest EU Directives (24-26) analysed in the second note of this research.

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, that are currently low, could be increasing, due to the necessity to conform their productions to the summentioned sustainability criteria and quality certifications. Moreover, the complexity of these approaches, e.g. certification schemes, 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 (27).

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, due to 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 of all the Chinese one) and the mandatory targets of biofuels that have been provided (China 15% by 2020, India 20% by 2012) (28), boosts an international approach and a further global monitoring of the trade of the first generation biofuels.

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