

Summary

of the **Public Thematic Report**

January 2012

Biofuel support policy

Notice

This summary is designed to make the Cour des Comptes report easier to read and use.

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The responses of government departments, councils and other organizations are appended to the report.

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Introduction

This assessment of the French Government's biofuel support policy is a public policy assessment made by the Cour des Comptes on its own initiative, in accordance with Article 47-2 of the French Constitution and Article 111-3-1 on the French Financial Jurisdiction Code.

Like public policies in other areas, the one supporting biofuel must overcome the difficulty of having to meet a combination of objectives. In fact, it was initially linked with support to agriculture, then with the quest for energy independence and later with environmental concerns. "Sustainability" encompasses not only the notion of environmental protection, but also social equity and the inter-generational bond.

The later priorities are additions to and not substitutes for the earlier ones. Consequently, any assessment of the positive or negative effects of policies must take into account the whole picture and consider the priorities in succession.

This makes it quite difficult to single out the effects of the various instruments in place: global, European and national regulations (incorporation mandates, border protection), tax instruments (exemption from domestic consumption tax on fuel associated with production quotas, general tax on polluting activities), waste recycling by double counting tallow and used cooking oils.

The biofuel support policy is also impacted by those implemented in other countries whether in Europe (Germany) or elsewhere in the world (United States, Brazil or Indonesia for example).

Government support for biofuels has increasingly become the subject of public debate. This is due to controversy about its environmental implications and because it is thought to be responsible for the highly volatile agricultural commodity prices observed since 2007.

A number of questions must be asked: is biofuel policy a matter of agricultural, energy or environment policy? Can its effects be verified and measured? Is public money being well-spent and is this spending justified? Who benefits? Are policy goals consistent with the instruments used to implement it? Is proper consideration given to uncertainties, especially those regarding sustainability and ethics?

This assessment covers all the "stakeholders" involved in this policy. Most of them are private natural persons or legal entities (including farmers, biofuel producers, oil companies, fuel

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distributors and car manufacturers) and, as such, are outside the Cour des Comptes' jurisdiction. This has called for the utmost transparency in conducting dialogue and the utmost objectivity in considering interests and viewpoints that were, by definition, different if not completely opposite.

The assessment was also based on the work of independent experts, selected for their specific individual skills before investigations began.

Lastly, international and, more specifically, European calibration was carried out. ■

1 Facts

Biofuels and energy

While energy is crucial for human society in general, it nonetheless poses a basic dilemma in that no source is without its drawbacks. Biomass is no exception.

Transport currently accounts for 25% of all energy consumed in the world, mostly as liquid fuel (2.5 bn m³). There are two types of liquid fuel, diesel oil and petrol. In Europe and especially in France, diesel oil is by far the more widely used of the two, while petrol (or gasoline as it is called in the USA) dominates in the Americas.

This has an impact on procurement. French refineries are old and produce more petrol than the domestic market needs, but too little diesel oil. As a result, the country must export its surplus petrol but import large quantities of diesel oil, especially from Russia.

The biofuels currently available on the market come largely from energy reserves from plant or animal waste. They are blended with hydrocarbons.

In France, they are distributed in two forms for use in motor vehicles: biodiesel, used in conjunction with diesel oil, and bioethanol, which is added to petrol.

Biodiesel is made in France not only from home-produced rapeseed and sunflower oil and imported soybean and palm oil, but also from tallow and used cooking oil. Crude vegetable oil is not used in motors as such, but as a derivative known as vegetable oil methyl ester or VOME. It is incorporated into diesel oil, generally at a rate of 7% v/v in B7 diesel, which is the maximum permitted amount, or, in a very limited number of cases, at a rate of 30% v/v in B30 diesel in the captive fleets of some cities or companies.

Biodiesel production is closely linked to that of its main by-product, rapeseed and sunflower cake, which plays an important role in livestock feed. It is also a major economic issue because the European Union has always been forced to import large quantities of soya bean cake from North and South America. Similarly, biodiesel production reduces to a certain extent diesel oil imports.

Bioethanol is an alcohol produced either by fermenting sugar from plants (sugar beet, sugar cane) or through grain starch hydrolysis (wheat, maize). It can be added directly to petrol at percentages ranging from 5 to 85% v/v. As it is more difficult to handle than biodiesel, it was once chiefly used in

conjunction with a refinery residue to produce ethyl tert-butyl ether (ETBE).

Like biodiesel production, ethanol production generates by-products (beet pulp, wheat or maize distillers grains) which are an important source of high protein livestock feed.

World biofuel production has risen sharply over the past ten years, climbing from 16 million m³ in 2000 to more than 100 million m³ in 2010. Significant as these figures are, they represent no more than 2.5% of the total fuels used in road transport. At 75% of the world total, ethanol dominates biofuel production, mainly because 90% of this total is produced by the United States and Brazil, where most vehicles run on petrol. The European Union has opted for biodiesel as most vehicles run on diesel oil. The EU produces half of the world's biodiesel.

It should be noted that biofuels output less energy by unit volume (LHV or lower heat value) than fossil fuels. This means that more biofuel than fossil fuel is required to cover a given distance. The gap is wider for ethanol (-34%) than for biodiesel (-8.5%).

Biofuels from an agriculture and environment perspective

In France, a little less than 6% of the total agricultural area, or 1.7 million ha, was given over to the production of biofuel raw materials in 2010. Of that total, 1.45 million ha was for biodiesel and 250,000 ha for bioethanol. Yet a greater area is given over to oilseed plants (2.2 million ha, of which oilseed rape covers two-thirds), as much of their production is intended for cooking oil (0.8 million tonnes).

The situation is quite different for ethanol. Only a very small amount of wheat (4.4%) is used for ethanol production, the rest being used for other purposes. The same is true for maize and, to a lesser extent, sugar beet. The world and European sugar market reform limited France's export capacity regarding sugar beet, thereby reducing the area given over to this crop. Ethanol production has made up for this loss.

From an environmental angle, biofuels were viewed favourably at the beginning since, unlike fossil fuels, they only release to the atmosphere what they have captured during their growth phase.

However, as of 2008 and the sharp rise in agricultural commodity prices, they were viewed more critically, because the more crops were used to produce biofuel, the fewer would be available to produce human food and livestock feed.

Also, the balance in terms of greenhouse gas (GHG) emissions has been constantly revised downwards. In addition, cost-benefit analyses have begun to give proper consideration to: a) the energy required to produce biofuels, compared with the energy they generated during combustion; b) the land use changes induced by the allocation of increasingly large areas of land to crops intended for their production.

The French Environment and Energy Management Agency (*Agence de l'environnement et de la maîtrise de l'énergie*, ADEME) was asked to carry out several studies on these points. The results of the first, completed in 2002, were rather positive, while the conclusions of the last, conducted in 2009/2101 and based on the life cycle analysis method, were rather less so, although they have been contested. According to the Agency, biodiesel GHG emissions are currently between 59 and 90% lower than those of the reference fossil fuel, while ethanol represents a 49-72% drop. Using the same reference fossil fuel, it takes 68 to 84% less fossil energy to produce

biodiesel and 18 to 85% less to produce ethanol. Environmental groups, however, contest this data. They do not agree with the by-product energy allocation method used and claim that the data makes no allowance for land use changes, especially indirect changes.

A great variety of rules

Many rules govern biofuel production, imports, distribution and consumption.

Tariffs are applied to biofuels, but only partly so. Biofuels are not, for example, singled out with respect to other uses of similar products (e.g. food-grade alcohol). Furthermore, oilseed products (including biodiesel) are duty-free for historical reasons. As an agricultural product, bioethanol should be well-protected. But this is almost no longer the case if it is blended - no matter how slightly - with petrol. The resulting "chemical product" is barely taxed at all. Lastly, an increasing number of suppliers come from the developing world and, as such, benefit from preferential tariff treatment, frequently paying no duty at all.

Several European directives lay down a wide array of principles:

- tax support measures are permitted provided they do not

overcompensate for the difference in production cost compared with fossil fuels;

- biofuels must meet the sustainability criteria defined in the European renewable energy directive;

- recommended minimum levels exist for biofuel incorporation: 5.75% by lower heat value (LHV);

- maximum levels are defined with respect to fuel quality: 7% v/v for diesel oil, 10% v/v for ethanol;

- waste recycling is supported by the “double-counting” rule applied to tallow or used cooking oils.

Lastly, there is a draft directive on energy taxation which would tax energy on the basis of CO₂ emissions and energy content (i.e. actual energy) that a product yields.

In France, regulations in this area are set out in the government’s 2005 fuel plan, which provides for an incorporation rate of 7% by LHV as of 2010, taking into account the lower energy output of biodiesel and ethanol. The 7% incorporation rate is equivalent to 7.57% v/v for biodiesel and 10.28% v/v for ethanol. These values are above the respective maximum permitted

incorporation rates for B7 diesel oil and SP95E10 petrol. As these targets are not legally mandatory, a very stiff general tax on polluting activities (*taxe générale sur les activités polluantes*, TGAP) was created in 2005 to be paid if the incorporation rate is not met.

French incorporation targets are above and beyond European ambitions. In reality, however, they are incompatible with fuel quality technical requirements (maximum incorporation rates) or distribution infrastructure realities or with the strategy of industrial stakeholders (oil companies and car manufacturers). Consequently, incorporation results fall short of the target. This was already the case for ethanol in 2009 and could also be true for biodiesel as of 2010.

Financial expenditure is almost entirely balanced by additional revenue

To meet the targets set out in its bio-fuel plan, France introduced a number of financial instruments as part of its general fuel tax system, under which fuels are subject to VAT and a domestic tax on petroleum products (*taxe intérieure sur la consommation*, TIC). The cost of these instruments since 2005 appears quite significant.

The TIC was thus significantly lowered, more so for ethanol (€37/hl in 2005) than for biodiesel (€33/hl). At the time, this difference was justified by the fact that ethanol costs more to produce than biodiesel. It has fallen steadily since its introduction and now stands at only €14 and €8/hl respectively.

To limit the impact of this tax expenditure on fiscal revenues, the TIC reduction was only granted under six year production licences or “approvals” (*agrément*s). The beneficiaries were production units selected by a competitive bidding process to meet EC regulations. Fifty-three such approvals were granted: twenty-nine for biodiesel, twenty for ethanol and four for ETBE. The last of

them expire in 2015. Generally speaking, they were oversized and the number of production units actually built has fallen well short of expectations, especially for ethanol.

Over the period concerned by this report (2005-2010), TIC reductions amounted to €1.8 bn for biodiesel and €0.85 bn for ethanol, making a total of €2.65 bn.

Owing to the lower energy density of biofuels, however, the government benefits from a mechanical increase in revenues:

- at the current incorporation rate, additional earnings from TIC on bioethanol amounted to €260 million/year in 2011. Total revenue for the period 2005-2010 amounted to €1 bn;

- although the difference between biodiesel and diesel oil is less than 10% in terms of LHV, the government benefits from increased TIC revenues owing to the large quantities sold: €143 million in 2011 and a total €0.5 bn over 2005-2010.

Over the same period, the government collected a total of about €0.33 bn in TGAP, a figure that has risen sharply since 2009. This is largely due to failure to meet the incorporation targets set out in the biofuel plan.

International comparisons

Since 2006, the United States has been the world's leading producer of biofuels, for which it grants massive subsidies. These are increasingly under fire today, to such an extent that the main subsidy was dropped on 31/12/2011. Ethanol has seen a real boom in the country: production capacity rose from 6.4 million m³ in 2004 to more than 41 million m³ in 2007. Biofuels are supported by domestic tax reductions which are applied not only to biofuels intended for the domestic market but also to those destined for export. This led to an explosion in biodiesel exports, particularly to Europe, until the European Union took antidumping measures in 2008 to check the situation.

Brazil, which is historically the world leader in ethanol production, still has a decisive edge in the field and has now begun to develop biodiesel production. The world's leading sugar producer, Brazil transforms nearly half its production into ethanol, which is highly competitive as "bagasse" (sugar cane residue) provides the energy required to

produce it. An estimated \$1 bn/year is currently spent in tax subsidies. Despite this, Brazil has not exported any ethanol in the past two years as, owing to poor sugar cane harvests, it has barely produced enough to meet fast-growing domestic demand. From zero production in 2005, the country now produces 1.6 million m³ of biodiesel per year.

Biodiesel is experiencing spectacular development in Argentina where it benefits from an export tax system that can be likened to a subsidy. Indonesia and Malaysia are also becoming major players on the biodiesel market. They are the world's two leading palm oil producers and are both developing significant esterification capacities for this product.

EU Member States have also introduced measures to support biofuel production to varying degrees. There are two exceptions: Germany, which has drawn back considerably from its initial position as one of the leading proponents of this policy and Sweden, which had built its entire policy on E85 petrol (85% biofuel), flexible-fuel engines and imports, for which the country had obtained a special dispensation from the European Union.

2 Stakeholders

Oil companies and distributors

France is a European exception in that large retail distributors are the outlet for 60% of the country's domestic market of 36 million t/year of diesel oil (including trucks) and 10 million t/year of petrol. The other 40% is divided more or less equally between Total and other oil companies.

Distributors see themselves first and foremost as “blenders” to implement incorporation rules.

Regarding **biodiesel**, oil companies/distributors have until now been very demanding about the quality of oils used in making VOME. In particular, the resistance of oils to cold varies with their origin, which can be detrimental to engines. The best compromise from this point of view is oilseed rape, although it has the drawback of a low energy yield per hectare. Consequently, this commodity has nearly reached its limits in Europe in terms of usable land area. In addition, as the use of diesel oil continues to grow, additional resources must be sought, either through imports or the use of animal fat or used oils.

Distributors procure their biodiesel from the leading manufacturers and as there is little competition, fossil diesel serves as the reference price, plus a bonus negotiated with the main supplier, Diester Industrie. This bonus, which is the result of the considerable burden placed on distributors by the TGAP, varies considerably with the relative prices of diesel oil and vegetable oil. It is currently \$400 to \$500 per tonne.

Total considers that **ethanol** will necessarily become the reference product, since incorporation as ETBE has only ever been a stopgap solution in view of the small quantity produced in France. Adapting distribution facilities for the direct use of ethanol should not prove too difficult as the cost involved is relatively low. Competition is tougher than for biodiesel as there is a genuine world market for this product, which represents 75% of all biofuel available. As a result, the extra cost to be paid compared with petrol is only \$100 to \$200 per tonne.

Total estimates that by 2020 ethanol will still be the reference biofuel and that Brazil will become the swing producer, capable of

supplying ethanol at a competitive price, while meeting the sustainability criteria set out in the new European directives.

One way of reducing the extra cost of biofuels might be to make incorporation rates a little more flexible by raising them when there is a slump in agricultural commodity prices and lowering them in the opposite case.

Car manufacturers

Manufacturers in the automotive industry are closely concerned by anything to do with biofuels, since engine guarantees also apply to any fuel-induced mechanical problems. Car manufacturers feel they are up against two types of problem.

The first is to do with engine CO₂ emissions. Their gradual reduction will represent an unprecedented additional burden over the next ten years. Until 2008, CO₂ emissions due to engines and fuels were considered together. As biofuels performed very well in this respect, they eased the pressure on engine manufacturers regarding emissions.

Since 2008, however, European regulations have made a distinction between these sources of emission. Consequently, manufacturers investing in a vehicle that can run effectively on biofuels will not be rewarded for their efforts to cut CO₂ emissions. This

explains why manufacturers are losing interest in biofuels. It also explains the disappearance of Flex-Fuel Vehicles (FFVs) in France, which were subject to a CO₂ emission penalty.

The second problem concerns the lack of stability in regulations issued by the European and French authorities. The various policies implemented in this area are subject to considerable interruptions and inconsistencies. Renault, for example, developed a range of vehicles using alternative energy sources, E85, B30 and LPG for the most part. The range is considerable and includes ten models running on E85 and six, including two utility vehicles, running on B30. These vehicles never found a market, however, for want of adequate support measures, and production was discontinued after only a few hundred or few thousand vehicles had been sold.

Long-term visibility is by far the most important factor. Engine manufacturers claims that it is easier and less costly for them to work on a limited incorporation range, even at a high incorporation rate, than on a broader range. In other words, over a period of five to eight years, they could produce engines compatible with fuel blends ranging from E10 to E30. It would be much harder to make an engine capable of absorbing blends ranging from E10 to E85.

Biodiesel producers

Sofiprotéol and its subsidiary Diester Industrie dominated the biodiesel market until 2010. The firm won 78% of approvals granted in 2009 and met the growing demand for biodiesel: 1.9 million m³ in France and 0.8 million m³ for export. It has seven plants in France and six more elsewhere in Europe. It explains this domination by stressing that it was the first firm to go into business at a time when the profitability of the sector was far from certain. It is nonetheless a fact that competition came late to this sector and that the newcomers are mainly companies that treat animal waste and take advantage of the double-counting rule.

Relations between Sofiprotéol/Diester Industrie and oil companies/distributors have been quite conflictual until recently. Under pressure from TGAP, distributors were compelled to accept Sofiprotéol's prices for lack of any real competition. Conditions were made even tougher by the high price of cooking oil, for it was in Sofiprotéol's interest to produce oil for cooking purposes rather than for esterification. This forced distributors to accept high prices for VOME. The situation changed rapidly, however, in 2010 and even more so in 2011. This was due to the increased

use of tallow and used cooking oils, which count double in the incorporation rate, and to the growth of vegetable oil and even ester imports from Argentina and Asia.

In 2011, Diester Industrie claimed it had lost an estimated 700,000 t in VOME production, due largely to the fact that its competitors imported 350,000 t of tallow. The firm would therefore like to see the double-counting rule abandoned or at least restricted. Introduced by a European directive, this rule has been transposed into French legislation, while Germany, for example, has ignored it and so far escaped any rebuke from the European Commission. A French Order reconsidered the rule in September 2011 and significantly limited its application.

Bioethanol producers

The ethanol sector is more diversified than the biodiesel sector and some competition exists. It is dominated by two organizations: Cristanol, a public company with a 55% stake belonging to an agricultural cooperative association; and Téréos, a cooperative association resulting largely from the acquisition of part of former Béghin-Say company assets. According to its members, the sector invested €1 bn from

2005 to 2010 to build five production units. These supply 13 of the 45 million hl of ethanol produced in the European Union.

The stakeholders appreciate the new opportunities provided by ethanol and by-products intended for livestock feed. Bioethanol provides sugar beet growers with better prices for the part of their production that does not go into sugar production. Similarly, ethanol stabilizes cereal growers' income by adding value to wheat when prices are low. Although this is not the situation today, as wheat is currently worth between \$250 and \$300 per tonne on world markets, operators point out that when the bioethanol sector started up in 2005-2006, it was traded at no more than \$80-\$90/t.

Stakeholders in the sector are concerned about Europe's domestic market protection being circumvented. Circumvention practices induced by the difference in customs duties applied to ethanol and blends have seen a considerable increase. Apart from the antidumping measures taken against the United States, the European Commission is neither able nor willing to take effective action against such practices. Rather than adopt a purely defensive attitude, the French ethanol sector has looked beyond Europe's borders. In

particular, it has set up plants in Brazil to benefit from the country's thriving sugar sector and from incentives aimed at promoting the use of ethanol fuel. Oil groups have adopted the same strategy.

Farmers' federations

Farmers' federations have a rather positive outlook on both sectors. Production was initially developed as a matter of agricultural policy, aimed in particular at making use of the fallow land imposed by the first reform of the Common Agricultural Policy. Today, however, the focus is on biofuels as a renewable energy source and on reducing greenhouse gas emissions.

Biofuels offer the following advantages:

- they provide farmers with an additional outlet which is bound to have a positive impact on selling prices and, therefore, on income. Furthermore, production unit procurements are agreed on a contractual basis, thus enabling farmers to stabilize their relations with their back-end operations. Be that as it may, prices are determined principally by world market factors. This makes it hard to establish any direct link between the tax advantages granted

to biofuels and the market price of the commodities used in making them;

- they have allowed more land to be given over to oilseed crops without impacting other crops or exports: biofuel by-products are taking over increasingly from wheat in livestock feed;

- they have helped to create or maintain around 18,000 jobs in a sector that, by definition, cannot be relocated.

In environmental terms, oilseed rape and sunflower growing promotes biodiversity and soil fertility and helps reduce inputs.

These advantages are nevertheless under threat from new competitors. All the efforts made over the past seven years could be simply wiped out unless effective border protection is set up.

Lastly, there is no conflict between food crops and crops used to produce biofuel in Europe and France. France's vocation as a cereal exporter remains intact even with the 2010 incorporation target. In addition, 400,000 ha of land is available with some of the fallow land being used for crops.

The French farmers union, *Confédération paysanne*, does not share this optimism at all and is extremely critical about the whole issue:

- first, it considers that the targets do not reflect real requirements, but variations in momentary trends. As environmental concerns have moved back to centre stage, the agricultural lobby has seized upon the objectives that meet these concerns. Although growing oilseed rape made it possible to sidestep the pressure that came to bear on oilseed crop production following the 1992 Common Agricultural Policy reform, the by-product, rapeseed cake, is harmful to animals. In addition, oilseed rape is a fragile plant that remains in the ground a long time. This calls for many inputs, pesticides in particular, and runs counter to the goal of halving the amount of pesticides used in agriculture defined by the French environment round table (*Grenelle de l'environnement*);

- the environmental performance of biofuels falls well short of expectations. If direct and indirect land use changes are taken into consideration, biodiesel GHG emissions are found to be twice those of fossil diesel oil. Producing biofuels as a safety valve in the event of a cereal surplus would be acceptable, if need be. The problem in these days of "compulsory" incorporation is that everyone depends on biofuels. Virtually all French rapeseed goes into biodiesel production, but not all biodiesel is made from rapeseed oil.

An increasing proportion comes from imported palm oil, the production of which also has disastrous effects on ecological balance in the producing countries.

Consumers associations

Apart from an article in the review “*UFC-Que choisir ?*” in 2007, consumers associations have published little in the way of in-depth studies on the topic. According to the above article, biofuel tax incentives were mainly to the advantage of producers. Under these conditions, French consumers purchasing biofuel at a reasonable price would benefit from imported ethanol - from Brazil in particular - without the need for costly tax resources. Furthermore, it would be extremely difficult to conduct a cost-benefit analysis of biofuels, especially in terms of environmental performance.

Environmental groups

Initially, most green associations tended to be in favour of biofuels. They are now more reserved, if not hostile, towards them. The reasons for this often match the concerns of scientists and include land use changes, deforestation, the negative

impact on biodiversity, competition with human food crops and exploitation of less developed countries.

One of the most controversial issues is land use change. Indirect land use change refers to a situation where the conversion of conventional food crops into energy crops can lead to the same amount of unfarmed land being given over to food crops in another part of the world. If combined with the destruction of carbon reserves in grasslands, forests and peatlands, this process generates high greenhouse gas emissions. Although indirect land use change is seen as a real problem, it is extremely difficult to measure and no consensus has yet been reached as to a possible solution in this respect. The European Commission is currently under great pressure to adopt a new approach to the issue.

Another hotly debated topic is the competition between energy crops and food crops. The French farmers union, *Confédération paysanne*, considers that the extreme elasticity of food commodity prices in relation to demand means that a small shortage of cereals on the market can cause prices to double. The reverse phenomenon is also true. It concludes that “what’s good for the human race would be disastrous for cereal growers.”

The cautious conclusions of the G20 on agriculture, held in Paris in June 2011, can also serve as a conclusion to these controversies. The G20 conclusions accept that the demand for biofuels is a contributing factor to price increases. The recommendations made lean towards abolishing subsidies and compulsory incorporation, and opening up international markets so that renewable fuels and their raw materials are produced and grown where they are the most economically, environmentally and socially viable.

The diverging views of different ministerial departments

The French Ministry of Agriculture considers that supporting biofuels is justified as it represents a commitment to operators in both sectors of biofuels production and meets the need to protect the domestic market. The ministry is particularly concerned about the circumvention of tariff protection. It considers this situation to be especially damaging as an estimated 53% of ethanol production capacity is not exploited and too sharp a rise in imports is bound to undermine a sector that is already weak. Similarly, recycling animal waste and the

double-counting rule should have been approached with more forethought.

Consequently, tax exemptions are still justified to recoup investments in new production units and reform energy taxes.

No final conclusion can be reached as to the impact of biofuels on food commodity prices and land use change.

At the Ministry of Ecology, the Commission for Sustainable Development (*Commissariat général au développement durable*, CGDD) sees tax exemption as a tax loophole that “might be environmentally harmful”. It considers that the TGAP at its currently excessive level serves little purpose with a reduced TIC and that any environmental benefit to be expected from biofuel crops is diminished by other effects.

It sees three possible future scenarios: totally abolishing tax exemptions as of 2012, gradually reducing them, or maintaining them within the framework of an initiative to standardize European energy tax systems.

The General Directorate for Energy and Climate (*Direction générale de l'énergie et du climat*, DGEC) considers that it is pointless prolonging costly subsidies and that external factors induced by energy crops - particularly their impact on water resources - should be studied more

closely. It shares the view that the impact of biofuels on world food prices is hard to ascertain because of the many factors involved. It recommends continuing research into the effect of indirect land use change. Lastly, it believes that second-generation biofuels will not be available until 2015-2020 in view of the R&D work still required before leaving the laboratory and proceeding to production on an industrial scale.

At the Ministry of the Economy, the Directorate General of the Treasury (*Direction générale du Trésor*) considers that the high penalty imposed by the TGAP and the fact that it can be passed on to the consumer provides biofuel producers with a captive income that can be likened to a subsidy. It also finds it rather inappropriate to implement a biofuel support policy as an agricultural development tool in that the farms concerned are already among the wealthiest and enjoy higher-than-average public support under the Common Agricultural Policy.

This analysis needs to be adjusted according to the sector concerned, however, as the ethanol sector is more fragile and more exposed to international competition. Once the cost of almost all production

facilities is written off, there will no longer be any justification for continuing public support, even for ethanol.

While the Treasury Directorate accepts bioethanol producers' calculations concerning the extra tax collected by the government due to the lower energy density of this fuel, it considers that they make no allowance for certain "general equilibrium" effects, a term referring to reduced consumption (and therefore tax revenue) in other areas as a result of pressures on household budgets.

Although importing low-cost American biofuels subsidized by foreign taxpayers may seem to make economic sense, using tariffs to protect the domestic market should help to develop sufficient production capacity to generate economies of scale and compete with imported biofuels. More broadly speaking, it might be wise to promote better-integrated biofuel markets in order to import biofuels at a lower price.

Lastly, although the connection between biofuel production and rising food commodity prices has by no means been proven, it might justify modulating incorporation rates according to the price of these commodities.

3 Results, costs and relevance of the biofuel support policy

Many instruments of diminishing effectiveness

The biofuel plan was complied with up to 2009 as regards ethanol incorporation; the requirements for biodiesel incorporation were only fulfilled from 2010 when so-called “off-road” diesel oil, i.e. diesel oil used by trains, bulldozers and tractors, was taken into account under the Renewable Energy Directive. However, this was a mere statistical manipulation.

Some of the approved production units have been built, with an indisputable success from the point of view of agro-industry. However, approvals have been vastly in excess of requirements, particularly for bioethanol which remains financially weak. A number of projects have been either abandoned or redirected towards another use. Some existing units have been shut down because they are unprofitable.

The targets set up by the French authorities, which were higher than the European ones, are now impossible to meet because of the lack of an adequate distribution network and because of technical difficulties related to fuels with a high biofuel content (E85).

The most effective instrument for ensuring that targets are met is the TGAP; its very high rate discourages distributors and oil companies from not incorporating biofuels.

Lastly, domestic market protection is more imaginary than real. Ethanol is poorly protected because of circumvention of tariffs by blended products, but biodiesel is better protected, not by non-existent tariff barriers but by a lack of competition on product quality. However, this situation is changing very quickly with the emergence of international competition, particularly from Argentina, which is indirectly subsidized.

In addition to this, the vegetable oil sector has suddenly been thrown out of balance by competition from animal fat and used cooking oils, which have the double-counting rule in their favour. This means that, when it comes to paying the TGAP, their actual incorporation rate counts as double. The rule was transposed into national law without any impact assessment, and implemented immediately as from 2010. With it came methods of circumvention and in 2011 it led to a 20% to 30% drop in the production of VOME and the shutdown of some production units. The rule was suspended in September 2011.

Results, costs and relevance of the biofuel support policy

From the point of view of environmental policy, the legal qualification of the description of national biofuels as sustainable was confirmed by the life cycle analysis conducted by ADEME, with a greenhouse gas emission saving of 35%, already required, and even of 50% required for 2017.

The ethanol sector has generated revenue for the government despite remaining fragile

It has benefited from a substantial tax exemption giving it partial protection in the beginning from imports and from higher production costs than fossil petrol, and this has ensured that it could cover its investment costs.

This was also facilitated by fixing commodity prices such as to balance the operating costs of the production units, therefore at a lower level than current market prices.

The government's support budget is currently in the black at €0.47 bn (the difference between the reduction in the TIC and the extra tax revenue generated as a result of the lower energy value of ethanol, plus €0.32 bn in TGAP).

The biodiesel sector has benefited from a large captive income

It was able to set advantageous prices in the first few years after the TGAP was introduced in 2005, because of the lack of any real competition.

It has benefited from support worth more than the cost of its investments.

In the end it had a net cost to the taxpayer of €1.29 bn (the difference between tax expenditure of €1.8 bn and €0.5 bn in additional tax revenues from extra consumption plus €0.01 bn in TGAP).

It benefited from a captive income due to the threat from the TGAP but is now exposed to competition both from animal and used oil and from high quality imports.

The total cost of both sectors to the taxpayer will have been no more than €820 million from 2005-2010 and will generate revenue in the future

In the future, if TIC exemptions are extended until the end of the approvals in 2015 as the government has prom-

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ised, the cumulative amount should reach €350 million and €170 million respectively for the two sectors over the 2012-2015 period, assuming the exemptions are kept at the same level.

Over the same period, the government should collect extra tax of more than €0.5 bn from extra consumption of diesel oil and more than €1 bn from extra consumption of petrol, giving a positive balance of €0.98 bn excluding the TGAP.

It is the consumer who foots the bill in the end

Because of extra fuel consumption and the TGAP, over the 2005-2010 period, consumers paid nearly €3 bn extra (€1.54 bn for consumption and additional taxes, €0.32 bn in TGAP for ethanol, €0.9 bn for consumption and additional taxes, and €0.01 bn in TGAP for biodiesel). Added to this, is the higher price of biofuels at the pump, contributing in 2010 to an estimated rise of between €0.5 and 0.7 bn.

The total extra cost of bioethanol incorporation into petrol when filling up with 50 litres, for the same mileage, is approximately €2.3. For biodiesel, the extra cost under the same circumstances is close to €0.60.

Relevance that has fallen victim to too many objectives

As with any policy that has multiple objectives, it is difficult to attribute the effects to only one of them and the distribution criteria between the objectives are themselves very difficult to work out.

A mixed result, erring on the positive for agriculture

From this point of view the results seem to be mixed. For the majority of those involved, the results are positive, but they are becoming increasingly controversial. Although the objective of bringing set-aside to an end has been achieved, the objectives concerning effects on agricultural income are much more difficult to measure, since farmers' income can change for many other reasons.

The diversification of market opportunities has been good for beet, extremely modest for wheat, and slightly better for maize. The question does not even arise for oilseed rape, for which biodiesel is by far the main market.

The impact of by-products, especially rapeseed cake, on livestock farm-

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ing has been significant but is disputed. Some believe they have a negative effect (*Confédération Paysanne*), but others (FNSEA) see them as having positive consequences. Although slightly less beneficial from a nutritional point of view, rapeseed cake has, in part, taken the place of cake made from soya in feeding livestock, its price having dropped dramatically.

As far as the impact on food prices is concerned, those who believe it has only been slight, argue that prices varied significantly between 2007 and 2010 (up first, then down, and then up again) despite the volumes used for biofuels not changing much. However, this does not constitute proof that they have had little impact, because it is not known whether the prices would have stayed the same without biofuels. Conversely, in the absence of biofuels, there is nothing to say that producers would not have adjusted production as a result.

Not as good an energy source as it might seem

Despite cautious estimates and some controversy, the ratio of fossil energy used to energy produced is considered positive. Moreover, the energy efficiency of both products is constantly improving, due to both the inputs (genetic improvements to beet, higher oilseed rape yields) and the production

processes (esterification of vegetable oils, distillation of wheat and beet, drying of draff). The problems posed by distribution are relatively easy to solve. At fairly low incorporation rates, such as those practised in the European Union at the moment, engine adaptation problems do not arise, or arise very little. The continuing rise in the price of a barrel of oil is making biofuels more competitive, particularly as they demand less fossil energy in their life cycle.

Having said that, to make a significant impact in terms of energy independence, higher incorporation rates would be needed. This would cause a number of problems as regards both engine adaptation and the amount of land necessary to meet the need.

For example, if France wanted to replace all of its diesel oil consumption with B30, 30% of its agricultural land would have to be given over to this.

From an environmental point of view, relevance is very difficult to measure and increasingly controversial

There is controversy over the environmental impact of biofuels on several levels.

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The first is the argument that the aim in terms of transport is to travel less, and biofuels are simply an excuse for continuing to drive around as much as before, despite fossil fuels running out and biofuels destroying biodiversity.

From the point of view of greenhouse gas emissions, the debate still rages over how the relative energy content of biofuels and their by-products is worked out. This method is very sensitive to changes in the definition of a product: a useful product contributes to the positive impact, but the same product categorized as waste has a negative impact.

One method of quantifying the reduction in greenhouse gas emissions economically is to use the cost per tonne of carbon dioxide saved. Taking as a reference the target price set by the European Commission of €32 in 2010 and €56 in 2020, several independent studies estimate that the price resulting from the introduction of biofuels to replace fossil fuels is around €186 to €259 for ethanol produced from beet and €263 to €347 for biodiesel produced from oilseed rape.

Since these figures seem very high, it should be pointed out that the price per tonne of carbon dioxide saved is always higher for transport than for other sectors of the economy.

Finally, these analyses do not take account of the issue of land use change, whether direct or indirect, the impact of

which (especially for the latter) is impossible to quantify seriously.

Simulating the allocation of support to the different objectives

Because no robust method exists for accurately apportioning the cost of a policy to its different objectives, the decision was made to produce a brief approximation by allocating a third of the total costs to each of the three objectives, agricultural, energy and environmental.

Based on total public expenditure of €2.65 bn over the period 2005-2010, a third is approximately €850 million.

Dividing this by the average amount of land used over the same period for biofuels i.e. approximately 1.7 million hectares, it gives a cost of €500 per hectare over 6 years, or €80 per hectare per year. This can be compared, for example, with the energy crop premium introduced by Brussels from 2004 to 2009, of €40 per hectare per year. If account is taken of the jobs retained, the amount of the support is obviously lower.

As far as hydrocarbon imports are concerned, it can be estimated that the production of biofuels has saved 11.5 million tonnes from being imported. It can therefore be inferred from this

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that the cost per tonne not imported is €74, only a fraction of the market price over the period, which fluctuated between €200 and €600/tonne for crude and €300 to €750/tonne for refined diesel oil.

The contribution per tonne of carbon dioxide emissions avoided can also be estimated. Based on an estimate of 20 million tonnes of CO₂ emissions avoided, a figure of €42.5/tonne is obtained, to be compared with the figure of €32/tonne used by the European Commission for 2010.

Biofuel support, world hunger, ethical issues

In the absence of any certainties concerning competition between crops destined for biofuels and crops destined for human or animal foodstuffs, most of the recent reports on this subject recommend, as a precaution, relaxing the incorporation rules in developing countries and stopping the various subsidies supporting biofuel production.

Similarly, the concept of sustainability is increasingly being linked with the concepts of social equity and ethics as public awareness of these issues grows, particularly through the work of NGOs.

Biofuels can only be labelled as sustainable when they have achieved ethical and social acceptability. A number of countries, particularly the UK, take account of these factors in their public policy on the environment. The moral values under debate are global equity, climate change, environmental ethics (especially effects on biodiversity), respect for human rights, and solidarity with vulnerable populations, particularly as regards the acquisition of land in developing countries by large western companies.

The prospects for new generation biofuels

Leaving aside any considerations of economic feasibility, the new generation biofuels, which rely on the non-edible parts of plants or on algae, will clearly not be available on a large scale for another 10 or 15 years. Moreover, no serious study has yet been done of future industrial processes, in terms of life cycle analysis.

Consequently, in the short and medium term the first generation biofuels will in all probability remain the main, if not the only, means of meeting the European targets for 2020.

Conclusion and recommendations

Findings

The finding is that after 15 years of policies in favour of biofuels, with intensified commitment to biofuels in the last six:

→ the only equilibrium that has really been changed by these policies has been agricultural (growing of oilseed rape, production of cooking oil and rapeseed cake, new markets for beet);

→ no other equilibrium, whether energy independence or the reduction of greenhouse gas emissions, has been altered a great deal, if at all;

→ while, in France, there has been some criticism of the cost/benefit of biofuels from the point of view of

their effect on the environment, the controversy surrounding this issue in other countries has been much larger and continues to grow;

→ substantial amounts of money, estimated for the first time by the Cour des Comptes, have been transferred from consumers/taxpayers into the hands of agro-industry (farmers and biofuel producers). These transfers have enabled the construction of raw material transformation and biofuel production facilities of significant size (capacity 1.91 million m³ of biodiesel and 1.25 million m³ of bioethanol) to be set up, but their financial stability is not entirely assured today.

Recommendations

The Cour des Comptes makes the following recommendations:

→ continue supporting production and sale of first generation biofuels, while meeting the following conditions:

→ recognise that the French authorities' desire to be more ambitious than their European partners has resulted in incoherent objectives which are now making it impossible to meet the targets for incorporating biofuels into fossil fuels.

→ redefine these targets to make them more realistic, while adapting

them to the technical constraints of both distribution (network adaptation) and engine manufacturers. Engine manufacturers can obviously adjust to most constraints, provided that they are clearly expressed (incorporation ranges of N% +/- 10%) and stable over time.

→ this could be compatible with introducing flexible incorporation rates within these ranges to take account of fluctuations in food prices, as suggested by the preparatory work for the meeting of G20 agriculture ministers in Paris in June 2011.

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- despite the fact that the large fluctuations in the price of staple foods observed in the last few years cannot reasonably be attributed directly or solely to the growth of crops for biofuels, it would be equally foolish to think this is not putting any pressure on demand when other factors are pushing prices up and therefore making foodstuffs scarcer.

- If these conditions are met, then public support for the production/distribution of biofuels should include the following:

→ development of a genuine knowledge, which is still lacking, of the financial data for the sector;

- reduction of the current support, for both ethanol and biodiesel from 2012, to below the level of the additional tax revenues generated as a result of extra consumption, which is itself a result of the lower energy potential of the biofuels.

→ when the cost of most of the production facilities is either paid off (in the case of the older ones) or is about to be paid off (in the case of the most recent), acceleration of the reduction in TIC exemption, while maintaining the current difference between biodiesel and ethanol until the tax exemption disappears, which should be envisaged without any new approvals for 2015;

- the relative fragility of the ethanol sector, which caters to limited and shrinking French and European markets justifies this difference. Taxation of energy based on energy value and CO₂ emissions, which the European Union is preparing for, seems the best solution for preventing ethanol, which is considered less polluting in terms of CO₂, from being taxed more than fossil fuel as is the case now.

→ keeping TGAP at a fairly high level, guarantees that incorporation targets will be met even though they are not compulsory, particularly as the windfall effects at its launch no longer exist because of a more competitive environment.

Apart from tax and customs measures, a biofuel support policy should also meet a number of requirements.

→ first of all, it should meet the requirement of consistency. The experimental nature of policy over the last few years cannot be used as an excuse for the inconsistencies that have affected that policy, and this is even more the case for the years to come. Incorporation rates should be clearly defined, along with whether they are binding or not. Sustainability criteria, including the double-counting of animal fat, should be clarified in the light of relevant European directives and the feasibility of checks. Engine manu-

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facturers should not be at the mercy of changing fashions, which affect fossil fuels (LPG) as much as alternative fuels (E85);

- the targets defined (biofuel type, consumption level, production date) should be compatible with the time scales for the design and industrial development of vehicles and should, more generally, be part of a comprehensive and sustainable overview of fuel use.

→ then, it should meet transparency requirements in relation to the public, consumers and taxpayers, by making it clear to the public whether biofuel policy is a genuine component of an environmental protection policy or whether it is simply part of a policy to support agro-industry.

- herein lies the credibility and acceptability of the package. It would be sensible to rely on a detailed opinion like the English report on biofuels and ethics, written by an independent body like the national ethics committee, and to promote a quantification of the effects of biofuels on biodiversity in this context.

→ thirdly, increase our presence on the subject at the European level.

- The interests need to be defended of:

- the sector as a whole has to be protected against subsidised imports or imports that circumvent the rules, while ensuring strict respect for sustainability criteria on the part of these imports and their verification;

- French manufacturers (car manufacturers and oil companies), have to be supported by promoting harmonization of the rules or curbs on the diversity of fuels, which can introduce complexity and extra costs without any real environmental benefits.

→ lastly, planning ahead for the future.

- Important negotiations will be starting with our European partners on energy taxation, which will profoundly affect the current gap between diesel oil and petrol and also biofuels. The future beneficiaries of the taxation differences should be identified to ensure the policy offers incentives and not undue captive income.