Sweetness and Power – Public Policies and the 'Biofuels Frenzy'

Douceur et pouvoir – les politiques publiques et la 'frénésie des biocarburants'

Die süße Macht – öffentliche Politiken und der Biokraftstoffrausch

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Biofuels have been used for over a century as a transport fuel. The last decade, however, has seen an extraordinary expansion in the industry in response to policy incentives put in place by governments worldwide. Policymakers have enacted these measures in response, in particular, to three concerns:

- anthropogenic climate change driven by rising greenhouse gas (GHG) emissions from the use of fossil fuels;
- energy security (a limited range of energy sources and energy suppliers, and volatility in energy markets); and
- concerns over the economic health and viability of rural communities.

This article presents a summary of findings from a research project, funded by the UK Economic and Social Research Council, which analyses international and domestic biofuels policy processes. The principal data collection method involved interviews and informal meetings with over fifty senior biofuels policymakers, industry representatives, and related policy participants in Brasilia, Brussels and Washington DC, between April 2010 and December 2011.

Why biofuels, why now?

Biofuels are very attractive to policymakers concerned about climate change, energy security and rural development. They have the potential to generate lower GHG emissions than fossil fuels; they are based on inputs ('feedstocks') that can be sourced at home and globally; they are renewable (which also helps energy security); and most biofuels produced currently utilise agricultural feedstocks, offering farmers diversified products and markets, whilst creating new rural job opportunities in biofuels production (see also, *inter alia*, Marshall *et al.*, 2011; Steininger and Wojan, 2011).

> "Un défi pour l'Union européenne et les États-Unis est de créer et de maintenir une large coalition de parties prenantes en faveur des biocarburants et des politiques en matière de biocarburants."

Furthermore, 'conventional' biofuels (those based on agricultural feedstocks) can be produced and distributed in industrial quantities now. The agricultural feedstocks are already produced, the technologies to convert feedstocks to biofuels are available, and the resulting biofuels can be blended with fossil fuels and used in existing vehicle engines. Thus politicians can be seen not only to express concern about environmental, energy security and rural issues, but to deliver something in response.

Conventional biofuels currently represent about 99 per cent of all biofuels produced. Their ability to substitute for fossil fuels, and the jobs they can bring, can be taken as given. The principal challenge for policymakers, therefore, is to ensure biofuels deliver on GHG emissions reductions. One interviewee argued that the best biofuel is always the next one, because we do not yet know its downsides. Yet some of the downsides of conventional biofuels, relating in particular to their environmental performance, were known when key legislation was enacted. Biofuels policies have sought partly to limit those downsides directly, partly by promoting 'advanced' biofuels which do not use agricultural feedstocks. Knowing about the downsides of biofuels is one thing, however; limiting and avoiding them continues to pose huge challenges.

Key policy drivers in the EU, US and Brazil

The EU, US and Brazil dominate global biofuels markets, as both suppliers and users (for a discussion focusing more on individual policy instruments, see Miranda *et al.*, 2011, and the references contained therein). EU policy grew out of wider environmental and climate change policy engagement in the 1990s. The 2003 Biofuels Directive set a voluntary target for biofuels use in transport fuel. Very quickly, however, the agenda shifted towards mandatory targets, incorporated into the 2009 Renewable Energy Directive (RED)

and set through to 2020. Moreover, the RED was part of the legislative Climate and Energy package, agreed in time for the 2009 COP15 climate negotiations in Copenhagen. Thus climate change has been central to EU policy, although energy security and rural development concerns have long been part of the policy discourse. Despite the environmental dimension of biofuels, one senior policy insider expressed concern that biofuels with poor environmental performance – arguably the hardest goal to deliver – could be defended if they delivered energy security and rural development.

In the US, President Bush, in every State of the Union Address following the 9/11 attacks, called for reduced dependence on imported oil. Thus the Energy Policy Act of 2005 included the Renewable Fuel Standard (RFS), a mandatory target for biofuels to be blended into transport fuel. An important feature of US policy emphasised to us by one senior insider, is that the rural focus is on 'Big Ag', not broader rural development issues such as biodiversity and the agri-environment. Another senior policy insider, meanwhile, revealed that for a long time, the climate change aspect of biofuels could only be whispered: only very recently has it gained prominence in discussions.

Concerns over the impact (and necessity) of oxygenates incorporated into petrol led, in 2005, to the removal of the requirement that they be included. The main concern was an oxygenate called MTBE,[1] but as ethanol was also an oxygenate, this decision hit ethanol sales. One Congress insider confirmed that the RFS was part of the response to this, following pressure from corn-growers and the ethanol industry for a new mandate-driven market for ethanol. State of the Union addresses continued to call for biofuels to replace more imported oil. Thus, in 2007, the Energy Independence and Security Act (EISA) included a revised RFS ('RFS2') which set a significantly higher biofuel mandate, through to 2022 (Thompson *et al.*, 2009, discuss how this is implemented).

Brazilian policy dates from the 1930s but took off in 1975, following not only the oil crisis, but low sugar prices following a very large, but short-lived, price spike. Thus, as in the US subsequently, the key pressures were over energy security and agriculture. By the late 1990s the ethanol market was essentially liberalised, as part of economy-wide reforms. In 2005 Brazil established a biodiesel policy with a significant social policy element. This reflects rural and wider economic development concerns, but with diesel demand expected to double in the next decade through economic growth, there is also an energy security factor. Brazil has also positioned itself as a global leader on environmental issues. Thus the emissions aspect of ethanol, in particular, is prominent in policy discourse, helped by the fact that Brazilian sugarcane-based ethanol delivers considerable GHG emissions reductions compared with fossil fuels.

Policy challenges in creating biofuels industries and markets

In both the EU and US, a broad coalition of interests has been created to help support the development of a biofuels industry and market. Policies in both jurisdictions have, initially, sought to stimulate supply and demand for (conventional) biofuels to establish the market, while providing incentives for its expansion through companies bringing advanced biofuels to market. Sustaining this pro-biofuels coalition requires crossing a technology 'bridge', by developing significant commercial production in advanced biofuels which utilise feedstocks such as woody biomass, algae and municipal solid waste.

This is necessary because, broadly speaking, conventional biofuels utilise agricultural feedstocks that can also be used as food for humans or feed for animals; advanced biofuels do not. Thus advanced biofuels avoid food-versus-fuel conflicts. Many inputs for advanced biofuels also reduce or avoid land-use change effects, because they do not take land away

from food production (and thus also avoid impacting on food prices), or are not produced on previously unused land, the cultivation of which releases carbon. These factors contribute to advanced biofuels being capable of delivering much better life-cycle GHG emissions reductions than conventional biofuels.

> “Sowohl für die EU als auch die USA stellte es eine Herausforderung dar, eine breite Koalition der Interessengruppen zu bilden und aufrechtzuerhalten, um Biokraftstoffe zu fördern.”

EU and US legislation show policymakers were aware of the downsides of conventional biofuels. In the EU, encouragement for crossing the technology bridge to advanced biofuels came, partly, in the form of advanced biofuels counting double towards usage mandates, but mainly through the direct funding of research. In the US, RFS2 includes explicit mandates for different biofuel types, guaranteeing a market for companies able to bring advanced biofuels to market. Until 2015, the increase in the overall mandate will come mainly from (conventional) ethanol. Conventional ethanol is then capped at 15 billion gallons, further increases coming principally from cellulosic materials. Confusingly, US policy uses the term ‘advanced biofuels’ to describe any ethanol that delivers a GHG emissions reduction of 50 per cent or more compared with fossil fuels. As a result, this concept does not exactly match the general meaning of ‘advanced biofuels’ as outlined above. Notably, Brazilian sugarcane-based ethanol is classified as an advanced biofuel for RFS purposes.

The establishment of RFS2 was accompanied by the granting of powers to the Environmental Protection Agency (EPA) to amend annual targets in RFS2 in line with actual production potential. So far, the EPA’s significant reductions in the (still-modest) cellulosic targets have been offset by production of other biofuels. Beyond 2015, a continued failure to deliver the much-increased cellulosic ethanol mandate could threaten the credibility of RFS2. Support for biofuels research is also provided, yet we were told that only recently was the decision taken to stop supporting research on conventional biofuels, to focus on cellulosics and, increasingly, drop-in fuels (biofuels that can be added to existing fuels and engines without affecting functionality).

That said, another shortcoming in US – and EU – policy may, paradoxically, deflect attention from these difficulties: the lack of coordination between biofuels supply and demand. The US in particular faces significant demand constraints as well as supply-side problems. The first is a blend wall. Fuel distribution infrastructure and petrol-fuelled engines are able to handle blends up to E10 (petrol with 10 per cent ethanol). After considerable debate and testing, the EPA approved the use of E15 for newer cars; but, with a lack of misfueling indemnity cover and questions over distribution systems, very little has come to market. Furthermore, increased fuel efficiency of the vehicle fleet and rising petrol prices are limiting petrol demand. This is problematic because RFS2 specifies a volumetric mandate – and limits to petrol sales limit the volume of petrol into which biofuels can be mixed. One option is to expand the sale of E85 (85 per cent ethanol) and flex-fuel vehicles capable of running on any petrol–ethanol mix, although fuel distribution is, again, a concern. Another is the development of drop-in fuels. Both, however, represent longer-term solutions. Current market conditions are finding something close to balance, albeit at much lower levels than RFS2 ultimately expects and based largely on conventional biofuels.

In the meantime, policymakers are trying to limit the negative impact of conventional biofuels. One potential downside is land-use change (LUC), in particular indirect land-use change (ILUC). Production of agricultural commodities for biofuels may trigger other land being brought into agricultural use, in response to declining food production and higher prices. Most US ethanol comes from domestic corn production. Corn has partly replaced wheat, soy and cotton, although reductions in the areas planted of these crops have also been driven by

factors unrelated to corn and ethanol. This cannot continue indefinitely. Moreover, beyond 2015 the failure to bring significant quantities of domestic cellulosic ethanol to market might, if demand-side constraints are eased even slightly, result in greater imports. This could see the US facing similar concerns to those the EU has to deal with.

Modest EU biofuels production means significant biofuel imports are required (with 'energy security' being diversification of sources and suppliers). With biofuels sourced along global supply chains, a complex set of policy issues has seen the EU adopt a sequential process of policy development. Following the publication of the RED in April 2009, sustainability criteria were developed, and published in June 2010. For biofuels to count towards the mandate, they cannot come from feedstocks produced on land with high biodiversity value, nor land which acts as a carbon sink. This seeks both to preserve these environmentally-important land-types and to deter biofuels with poor GHG emissions reduction performance (see also Zahniser, 2010). The sustainability criteria were thus accompanied by default values for the GHG emissions performance of different feedstocks and technology pathways for conversion to biofuels. This poses considerable technical challenges, although the legislation allows for producers to submit evidence that their biofuels deliver a greater GHG emissions reduction than the default.

The sequential nature of EU policymaking has also meant that these initial estimates did not include any recognition of the land-use change effects. ILUC poses a particular problem because it cannot be observed directly, only modelled, and understanding of the complexities of ILUC remains partial and contested. Comprehensive GHG emissions reductions calculations are thus crucial to ensuring biofuels deliver on their environmental promises, yet considerable challenges remain to producing accurate estimates. That said, almost simultaneously in early 2012, the EU and US produced estimates of GHG emissions from palm oil-based biodiesel (a particularly vilified biofuel given environmental concerns) that suggest it may not be eligible for inclusion in either jurisdiction's mandate.

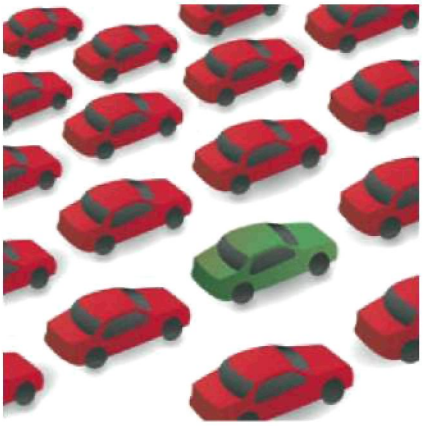
A further challenge to EU policymakers is the possibility that the sustainability criteria could, of themselves, represent a trade barrier under the WTO, although those involved directly with drafting the legislation confirmed they were designed explicitly with WTO concerns in mind (see, *inter alia*, Ackrill and Kay, 2011). Indeed, despite pressure from, for example, the European Parliament, *social* sustainability factors were excluded. It was believed they would cross the 'red lines' of some social actors and governments, and thus very likely trigger an action in the WTO, threatening the whole biofuels policy.

> "A challenge for both the EU and US has been to create and sustain a broad coalition of stakeholder interests in support of biofuels."

Brazil's ethanol challenges arise from a combination of the liberalised nature of the ethanol market, and the fact that biofuels overlap extensively with food and oil markets. A combination of high sugar prices and poor sugarcane harvests has seen less cane going to ethanol production. In response the government temporarily reduced the percentage of ethanol blended with petrol. Meanwhile, high ethanol prices have resulted in very limited E100 ethanol sales, even though most cars in Brazil are flex-fuel. The long-term strategy of the Brazilian government is to expand sugarcane production significantly, with locations dictated by the agro-ecological zoning policy. In a manner similar to importers' sustainability criteria, this helps avoid expanding sugarcane production onto environmentally-unsuitable types of land.

Policy challenges moving forward

Biofuels policies have been driven by three key concerns: climate change, energy security and rural



development. The EU, US and Brazil, have deployed all three arguments in order to build support for biofuels, but with each giving different weight to different arguments at different times. The EU and US have also sought to promote both conventional and advanced biofuels in the policy mix. The former can be delivered now in significant quantities, with complementary policies seeking to limit their potential downsides. Advanced biofuels have fewer known downsides, but commercially-viable production remains limited. This has resulted in a bifurcated policy which, in turn, threatens both the pro-biofuels coalition and the long-term credibility of existing biofuels policies.

We now see market factors creating something of an impasse. The EU is moving towards its 2020 target, with more third-country producers gaining production sustainability certification. Yet, as imports rise, the challenges of ensuring environmentally-sustainable supply chains remain. In the US, supply-side and demand-side factors present enormous challenges to further market expansion anywhere near the level intended for 2022. Meanwhile in Brazil, until recently seen as being capable of supplying anybody and everybody's biofuel needs, the reality of interconnected biofuels, oil and agricultural markets has led to imports from the US. Brazil, however, has the capacity to expand sugarcane production sufficiently, over the coming decade, to help redress current biofuels shortfalls without compromising sugar markets. Where the EU and the US go from here is much harder to predict. In the EU, the significant market share of diesel in transport fuel allows for continued increases in biofuels to be blended, but ever-greater scrutiny will be given to supply chains, sustainability and LUC. In the US, the constraints on supply and demand sides suggest the main long-term options currently are a wholesale shift to flex-fuel vehicles and high ethanol blends, and/or the development of drop-in fuels capable of being produced on a large scale. One long-time observer of policy said to us that advanced biofuels are 5 years away – and have been 5 years away for 30 years.

Acknowledgements

The authors gratefully acknowledge the financial support of the ESRC, Small Research Grant RES-000-22-3607. They thank the policymakers, industry officials and experts interviewed who gave their time so freely and willingly, but for whom anonymity was a condition of access. They also thank the Editor and two anonymous referees for very helpful comments. The usual disclaimer applies.

Notes

1 MTBE (methyl tertiary-butyl ether) gave rise to concerns over polluted groundwater, leading to a number of States banning its use. The 2005 Energy Policy Act did not follow suit but, in addition to removing the oxygenate requirement, it introduced tighter rules governing underground storage tanks. It also removed liability protection linked to the pollution caused.

Further Reading

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summary

Sweetness and Power – Public Policies and the 'Biofuels Frenzy'

In the last decade, there has been a huge policy-led expansion in biofuels production and consumption. This paper presents some of the findings of a funded research project which has sought to identify the drivers of biofuels policies over this period. It focuses on the EU, US and Brazil which, together, represent about 90 per cent of global biofuels markets. Biofuels policies have three key drivers: as a partial substitute for fossil fuels, to lower greenhouse gas emissions; as a way of improving energy security, by diversifying away from fossil fuels and from the limited number of countries with fossil-fuel reserves; and as a means of promoting rural development, given the opportunities offered by the production of biofuel feedstocks and their processing into biofuels. One particular challenge for both the EU and US has been to create and sustain a broad coalition of stakeholder interests in support of biofuels and biofuel policies. Both have sought to promote 'conventional' biofuels now, whilst trying to aid the development of 'advanced' biofuels industries that will address problems with existing technologies. The continued failure to deliver significant quantities of advanced biofuels raises questions for biofuels policymakers going forward, not least dealing with the downsides of conventional biofuels that, so far, have not been mitigated by a successful transition to advanced biofuels.

Douceur et pouvoir – les politiques publiques et la 'frénésie des biocarburants'

Au cours de la dernière décennie, les politiques ont causé une énorme expansion de la production et la consommation de biocarburants. Cet article présente certains des résultats d'un projet de recherche qui visait à expliquer les politiques en matière de biocarburants sur la période. Il se concentre sur l'Union européenne, les États-Unis et le Brésil qui, ensemble, représentent environ 90 pour cent des marchés mondiaux des biocarburants. Les politiques en matière de biocarburants sont expliquées par trois principaux arguments : en tant que substitut partiel des carburants fossiles pour diminuer les émissions de gaz à effet de serre; comme moyen d'améliorer la sécurité énergétique en se diversifiant au-delà des carburants fossiles et du nombre limité de pays fournisseurs; et comme moyen de promouvoir le développement rural, compte tenu des opportunités qu'apporte la production des matières premières des biocarburants et leur transformation. L'Union européenne et les États-Unis ont eu à relever un défi particulier : créer et maintenir une large coalition de parties prenantes qui accepte de soutenir les biocarburants et les politiques les concernant. Les deux pays ont cherché à soutenir les biocarburants 'conventionnels' dès à présent, tout en essayant d'aider au développement des industries de biocarburants 'avancés' qui résoudrons les problèmes de la génération actuelle. On n'a toujours pas réussi à obtenir des quantités notables de biocarburants avancés. Cela interpelle les décideurs de l'action publique en matière de biocarburants pour l'avenir, en particulier en ce qui concerne les inconvénients des biocarburants conventionnels, qui jusqu'à présent, n'ont pas été compensés par une transition réussie vers les biocarburants avancés.

Die süße Macht – öffentliche Politiken und der Biokraftstoffrausch

Im letzten Jahrzehnt fand ein umfassender, von der Politik vorangetriebener Ausbau der Produktion und des Verbrauchs von Biokraftstoffen statt. In diesem Beitrag werden einige Ergebnisse eines geförderten Forschungsprojekts dargelegt, das zum Ziel hatte, die Einflussfaktoren der Biotreibstoffpolitiken in diesem Zeitraum zu bestimmen. Wir konzentrieren uns auf die EU, die USA und Brasilien, die insgesamt etwa 90 Prozent des weltweiten Biokraftstoffmarkts ausmachen. Biotreibstoffpolitiken werden durch drei wichtige Einflussfaktoren gesteuert: teilweiser Ersatz für fossile Brennstoffe, um Treibhausgasemissionen zu senken; Verbesserung der Energiesicherheit durch Ausweitung des Angebots hin zu alternativen Brennstoffen und somit weg von der Beschränkung auf die begrenzte Zahl von Ländern mit fossilen Brennstoffreserven; Förderung der Entwicklung des ländlichen Raums in Anbetracht der Möglichkeiten, welche die Produktion der Rohstoffe für Biokraftstoffe und deren Weiterverarbeitung bieten. Sowohl für die EU als auch die USA stellte es eine besondere Herausforderung dar, eine breite Interessenkoalition der Akteure zu bilden und aufrechtzuerhalten, um Biokraftstoffe und Biotreibstoffpolitiken zu fördern. Beide versuchten, "herkömmliche" Biokraftstoffe zu fördern, und gleichzeitig die Entwicklung "fortgeschrittener" Biokraftstoffindustrien voranzutreiben, die sich der Probleme in Zusammenhang mit bestehender Technologie annehmen. Es ist nach wie vor nicht möglich, fortgeschrittene Biokraftstoffe in ausreichenden Mengen zu liefern, was Politikakteuren im Bereich Biokraftstoff Probleme bereitet; und nicht zuletzt müssen sie sich mit den Nachteilen von herkömmlichen Biokraftstoffen auseinandersetzen, die bislang durch eine erfolgreiche Umstellung auf fortgeschrittene Biokraftstoffe nicht abgemildert werden konnten.