Biofuels and Certification

A Workshop at the
Kennedy School of Government
May 11–12, 2009

Charan Devereaux and Henry Lee

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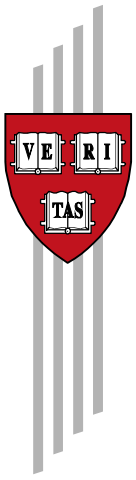

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It is available at http://www.cid.harvard.edu/cidwp/187.html. Comments are welcome and may be directed to Henry Lee at the Belfer Center for Science and International Affairs, Harvard Kennedy School, Harvard University, 79 JFK Street, Cambridge, MA 02138, henry_lee @harvard.edu.

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The Environment and Natural Resources Program at the Belfer Center for Science and International Affairs is the center of the Harvard Kennedy School's research and outreach on public policy that affects global environment quality and natural resource management. Its mandate is to conduct policy-relevant research at the regional, national, international, and global level, and through its outreach initiatives to make its products available to decision-makers, scholars, and interested citizens.

More information can be found on ENRP's website at www.belfercenter.org/enrp or from director Henry Lee (henry_lee@harvard.edu) or program administration Amanda Swanson (amanda_swanson@harvard.edu) at ENRP, Harvard Kennedy School, 79 JFK Street, Cambridge, MA 02138 USA.

PREFACE

This workshop on biofuels and certification was carried out as part of an ongoing collaboration between the Harvard Kennedy School's Environment and Natural Resources Program (ENRP), and the Sustainability Science Program (SSP) to investigate policy options for the sustainable development of biofuels. The collaboration has focused on exploring whether, and if so, how, biofuels could be developed in ways that simultaneously help to meet the world's energy needs, protect the environment, and advance the livelihoods of farmers and other land users around the world. Products of the continuing collaboration can be found at the Sustainability Science Program's Biofuels and Globalization Project website:

www.cid.harvard.edu/sustsci/activities/research/biofuels

On May 11th and 12th, 2009, ENRP and SSP brought over 20 of the world's leading experts from the fields of science, policy, and business to Cambridge, MA to address the issues surrounding biofuel certification (see Appendix A for a list of the participants). The discussions were off-the-record, with each participant present in his or her own capacity, rather than representing an organization (see: www.cid.harvard.edu/sustsci/events/workshops/09biofuels). This workshop was informed by the discussion at a session held in May 2008 at San Servolo Island, Venice, Italy that focused on the goals and concerns surrounding the use and production of biofuels. The report for the San Servolo session is available at: www.cid.harvard.edu/cidwp/pdf/174.pdf .

This summary report of the Workshop on Biofuel Certification represents a synthesis of the main points and arguments that emerged from the discussion. It does not represent a consensus document, since no effort was made at the Workshop to arrive at a single consensus view. Rather, the report reviews the major themes discussed and where there was significant disagreement, we have tried to present both sides of the argument. Any errors or misrepresentations remain our responsibility.

A workshop of this type is made possible by the commitment and hard work of many people. I would like to thank the Italian Ministry of Environment, Land & Sea for its financial and substantive support of this workshop, especially Director General Corrado Clini and Gloria Visconti. I would also like to thank Kira Matus, Rodrigo Wagner, Melinda Kimble, Bill Clark, Ricardo Hausmann and Robert Lawrence. Charan Devereaux served as rapporteur for the session. Finally, I am grateful to Amanda Swanson, who served as the coordinator for the workshop and whose help was essential to its success.

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Executive Summary

Liquid biofuels can provide a substitute for fossil fuels in the transportation sector. Many countries have mandated the use of biofuels, by creating targets for their use. If not implemented with care, however, actions that increase biofuel production can put upward pressure on food prices, increase greenhouse gas (GHG) emissions, and exacerbate degradation of land, forest, and water sources. A strong global biofuels industry will not emerge unless these environmental and social concerns are addressed.

Interested parties around the world are actively debating the design and implementation of policies to meet the biofuel goals, particularly those established in the United States and Europe. In general, policy options for managing the potential risks and benefits of biofuel development should specify not only clear standards governing biofuel content and production processes, but also certification processes for verifying whether particular biofuels meet those standards, and specific metrics or indicators on which to base the certification. Historically, many standards in the energy and environment fields have ultimately been set or supported by governments. Many of the certification processes have been voluntary, carried out by independent third parties. The biofuels case is a young one, however, with questions of goals, standards, certification, and metrics still in interdependent flux. The workshop focused its discussions on certification issues, but found the discussions naturally reaching into ongoing debates regarding possible goals, standards, and metrics.

Many countries are proposing that for a biofuel to qualify as contributing to government-mandated targets or goals, it must be certified to meet certain standards. These standards could be limited to the amount of GHG emitted in the production process or could include a number of other environmental sustainability concerns ranging from deforestation and biodiversity to water resources. While the threat to both forests and food supplies from increased biofuel production is real, it is not clear that setting broad sustainability standards and then requiring sellers to certify that all of those standards have been met is the best way to address these interconnected problems. In particular, if too many standards and related certification requirements are put in place too soon, this could constrain the development of a global biofuels market. In contrast, certification targeted at a specific and limited set of problems and designed with the flexibility to adjust to changes in policies and programs can enhance the public's acceptance of the biofuel option while protecting key social and environmental goals.

A second set of questions revolves around the locus of responsibility for certifying whether biofuel production meets sustainability targets. Should the biofuel processing firms, third parties, or governments be responsible for certifying the production of biofuels? This question also elicited significant discussion. While it could be easier to have individual country governments assume the certification of production responsibility, some governments may not have the capacity to implement an effective certification process. Production facilities that comply with international standards should not be kept out of the market because of their government's inability to manage the process. The possible contribution to effective certification of third party organizations or public-private partnerships should not be underestimated.

Introduction

Biomass can be used to provide energy in many forms including electricity, heat, and solid, gaseous, and liquid fuels. Approximately two billion of the world's poorest people use biomass directly for cooking and heating. This workshop focused on only one component of energy from biomass: liquid biofuel for transportation.

Liquid biofuels can help meet growing energy needs, lower greenhouse gas emissions, improve energy security, and boost farmer incomes. The use of biofuels can also promote development in poorer countries that have good growing conditions for biofuel feedstock. Production of some biofuels, however, may not decrease GHG emissions and can result in a variety of negative environmental, economic, and social impacts. These may include increasing the price and reducing the availability of food crops, a loss of biodiversity, degradation of water resources, and the acceleration of deforestation.

One strategy to manage these concerns is to *certify* that biofuels meet certain sustainability standards. Because countries have mandated the use of biofuels in part to reduce GHG emissions, governments want to ensure that the production and use of biofuels will indeed result in decreased emissions when compared to the use of conventional motor fuel. Governments and other stakeholders, including non-government organizations (NGOs), may also want to ensure that the production and use of biofuels will not raise the price of food, overuse or pollute water resources, increase deforestation or despoil other environmentally valuable land, or violate social norms such as child or slave labor.

There are two approaches that governments, industry, and other stakeholders might adopt. Under the first, companies would voluntarily seek a third party entity to certify that their production processes adhere to sustainable practices. Purchasers of their biofuels would know that they were produced in a more sustainable manner than similar uncertified products. Many existing certification processes follow this model. A second approach is to establish a government mandate requiring the use of a particular category of products and then require that the production process for those products meet certain standards in order to be eligible to meet the mandate. Products that are certified as meeting those standards would be included in the government program and those that do not meet the standard would be excluded. Such a certification process takes on a more mandatory character than traditional certification processes. The question is can stakeholders design a multi-purpose certification process for biofuels that will meet all of the

desired goals? Or are the areas of concern so broad that a single certification scheme can not effectively deal with them all?

If biofuel certification systems are put in place, there are several models to consider. For example, who will certify biofuels? Should a certification system operate at a national level, regionally, through a participating group of member countries, or through a global regime? Stakeholders also must determine if certification will occur at the firm level or country level.

Stakeholders must also deal with several controversial challenges. For example, one question is how to measure greenhouse gas emissions released in biofuel production. Some believe indirect land use changes must be considered when determining GHG emissions. Should stakeholders use biofuel certification processes as a means to govern these indirect effects? Critics argue that such efforts have moved far ahead of current science, saying that the methods of estimating emissions from land conversion are too uncertain to use in regulation. Proponents assert that to ignore indirect land use changes because of methodological shortcomings would be contrary to governments' obligation to ensure that biofuels mandates do not result in even greater GHG emissions.

Some participants also cautioned against overloading biofuels certification systems, noting that the industry could be halted before it even begins. A rigid standard and certification process may create disincentives for producers of second generation fuels, creating a chilling effect on investment, especially in developing countries.

Finally, can biofuel certification offer incentives to create a global biofuels market? The world has significant untapped agronomic potential for biofuel feedstock production, which is concentrated in a subset of developing countries that have the right growing conditions. But some say there may be little interest in wealthier countries to work towards the development of a biofuel industry in the developing world. The domestic drivers that led developed countries to mandate biofuel use do not necessarily translate into enthusiasm for the development of a global market.

This report reviews the workshop discussion of each of these major issues related to the design and implementation of a biofuels certification process. Before turning to the specific challenges, the report reviews the reasons why governments mandated the use of biofuels and the major concerns about biofuel production and use. It then discusses the status of existing efforts to promote greater sustainability in the biofuel production chain and the criteria that might be used

by governments or third parties in the design of standards to promote sustainability and the certification processes to support those standards.

1. Why Biofuels?

Policymakers, business representatives, academics, and members of civil society have supported biofuels for different reasons. There are four primary drivers for the adoption of biofuels: impacting climate change, increasing energy security, creating rural development opportunities, and supporting farm incomes.

1.1. *Climate Change:* Growing concern over global climate change has motivated interest in renewable energy sources, including biofuels. With transport contributing around 25 percent of global carbon dioxide emissions (a percentage that is expected to grow over the next two decades), biofuels could potentially contribute to reducing net greenhouse gas emissions. When produced and used appropriately, biofuels can deliver lower net GHG emissions than gasoline. But the net emissions of biofuels vary significantly depending on the feedstocks and technologies used in their production and consumption. For example, production and use of corn-based ethanol releases more GHG than ethanol made from sugar cane. It is believed that once commercialized, second generation biofuels made from crops like switchgrass or from cellulosic waste may result in further reductions of GHG emissions.

1.2. *Energy Security*: In 2007, global oil demand averaged 85.8 million barrels per day and the demand for liquid fuels is forecasted to increase to 106 million barrels per day by 2030.[1] Most of the incremental fuel will come from the Organization of Petroleum Exporting Countries (OPEC), specifically the Middle East. As of 2006, 57 percent of all liquid fuel consumed in the OECD countries is used for transportation.[2] While there are substitutes for oil in the heating and power sectors, biofuels represent one of the only alternatives to petroleum-based transportation fuel. As a result, some countries are looking to biofuels to decrease their reliance on petroleum. Because biofuels are usually

[1] International Energy Agency, *World Energy Outlook 2008 Executive Summary*, November 12, 2008, p. 4. http://www.worldenergyoutlook.org/docs/weo2008/WEO2008_es_english.pdf

[2] Energy Information Administration, *International Energy Outlook 2009*, p. 99. http://www.eia.doe.gov/oiaf/ieo/pdf/0484(2009).pdf.

produced in countries outside of OPEC, their use could also provide energy security benefits by allowing energy importers to diversify the sources of transport fuels. While some debate the significance of these energy security advantages, until alternative transportation fuels (such as hydrogen) or alternative vehicles (such as plug-in electric cars) can be produced at a competitive price, biofuels remain one of the few supply options available to national governments worried about dependence on imported oil.

1.3. *Rural Development:* Biofuels and their feedstocks could be an important source of export income for developing nations. History has shown that participation in the global economy through export activity is a crucial component of the economic development process. In some tropical countries, biofuel production could bring with it "stepping stone" effects such as the extension of transportation networks, increased infrastructure, and job creation. In addition to growing biofuels for export, countries could substitute domestically-produced biofuels for imported oil. Biofuel production also presents an opportunity for new companies to emerge.

1.4. *Supporting Farmer Incomes:* Though there is interest in rural development in developing countries and spurring international trade in biofuels, most biofuels are currently produced and consumed domestically. International trade is limited; in fact, only 10 percent of ethanol is traded outside of national borders. The primary supplier to the small global market is Brazil. As opposed to the creation of an international market, some biofuels supporters are more interested in creating domestic economic and agricultural opportunities, especially supporting farmer incomes. For example, many proponents of biofuels in the United States focus on the potential benefits for U.S. farmers as opposed to farmers in sub-Saharan Africa or South East Asia.

2. What are the Concerns about Biofuels?

Just as there are multiple goals that that can be achieved through sustainable biofuel production and use, there are also multiple concerns about the impact of biofuels. There was a strong feeling among the workshop participants that a vibrant global biofuels industry will not emerge unless these environmental and social concerns are addressed.

Some experts argue that increased production of biofuel feedstocks has contributed to higher food prices by displacing land that would otherwise be used for food production. With world population increasing, an additional 300 million acres may be needed to provide the food for a growing population. Some say that though there has been little research into developing energy crops that are not competitive with food crops, this is slowly changing. For example, China and India are focusing biofuel research efforts on non-food feedstocks like jatropha. In addition to concerns about food prices and availability, some argue that the production of certain biofuels adversely affects water resources, either through overuse or pollution (especially from nitrogen run-off).

Critics also question the claim that the production and use of biofuels reduces greenhouse gas emissions when compared to gasoline. One reason is that intensive use of land to grow biofuel feedstocks—like intensive use of land for food or fiber production—could cause environmentally valuable land, such as untouched forests, grasslands, or parks, to be cleared and farmed. Critics say that the profit opportunities presented by biofuels will discourage governments from protecting lands of unique value, impacting conservation efforts and contributing to problems such as loss of biodiversity. Environmentally valuable lands could also be lost through indirect effects—as more biofuels are grown, food prices will increase and more land may be deforested and cleared for agriculture.

However, some argue that many of the concerns listed above are not exclusive to biofuels—the same criticisms could be levied against any food or non-food crop. In addition, certain challenges are perceived to be the result of biofuel production, when the problems may be more complex. For example, in the food versus fuel debate, even though biofuel production is not expanding in the United States, food prices remained high through the first quarter of 2009. Is increased biofuel production a larger threat to the world's tropical forests than the growing world demand for meat, as per capita incomes increase and people change their diets? In summary, biofuels production may be a contributor to certain challenges, but it is not the only one.

3. Existing Biofuels Legislation

In the United States, the 2005 Energy Policy Act established a Renewable Fuels Standard (RFS), requiring the blending of biofuels in the nation's transport fuel supply. Specifically, it mandated the use of 7.5 billion gallons of renewable fuels by 2012. The December 2007

Energy Independence and Security Act (EISA) increased the renewable fuels mandate to 36 billion gallons by 2022, with 15 billion gallons of ethanol and 5.5 billion gallons of "advanced biofuels" by the year 2015 and 21 billion gallons of advanced biofuels by 2022 (starting with 100 million gallons of cellulosic biofuels in 2010).[3]

The EISA reflects the U.S. focus on energy security. However, the legislation also has environmental goals. The revised RFS (also known as RFS-2) required first generation or conventional ethanol production to emit 20 percent less greenhouse gases than gasoline, and advanced biofuels to release 50 percent less GHG (with cellulosic biofuels releasing 60 percent less GHG).[4] When evaluating fuels under the RFS-2 program, the EPA was required by EISA to calculate the "life cycle greenhouse gas emissions" for biofuels including "significant indirect emissions." In May 2009, the EPA issued draft rules on the 2007 Renewable Fuels Standard, including provisions on how to measure GHG emissions released in the production of ethanol and other biofuels. Critics have attacked the EPA's methodology as based on false assumptions.[5]

Also in the United States, individual states have adopted rules that impact biofuels. The state of Oregon expressly excludes food crops from biofuel production. In addition, the California Air Resources Board (CARB) adopted a Low Carbon Fuel Standard (LCFS), which requires a 10 percent reduction in GHG emissions per unit of energy for gasoline and diesel fuel by 2020 (as opposed to mandating the use of a particular fuel, like the RFS).[6] The LCFS approach also accounts for indirect land use emissions.

In the European Union, in December 2008, the European Parliament and the European Council agreed on a directive on reducing emissions from transport fuels, which would go into effect in January 2011.[7] The Renewable Energy Directive would require 10 percent of all transport fuels to come from renewable sources by 2020 (as part of the EU's climate change proposal to reduce emissions 20 percent by 2020). To count as a renewable fuel, biofuels must contribute at least 35 percent less GHG emissions than fossil fuels. By 2017, the GHG emission savings would increase to 50 percent. Advanced "second-generation" biofuels produced from waste, residues, or non-food cellulosic sources would be double credited

[3] See http://www.epa.gov/otaq/renewablefuels/ and http://www.epa.gov/otaq/renewablefuels/rfs2-4standards.pdf
[4] See http://www.epa.gov/otaq/renewablefuels/420f09023.htm
[5] As regulated by the legislation, corn ethanol plants that were producing or under construction as of December 2007 are grandfathered or exempted from the new regulations.
[6] Dan Charles, "Biofuels: Corn-Based Ethanol Flunks Key Test," *Science*, Volume 324, May 1, 2009, p. 587.
[7] See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF

towards the 10 percent target. Earlier versions of the directive included social and indirect emissions criteria for renewable fuels. However, the recent compromise asks the European Commission to submit a report reviewing the impact of indirect land use change on GHG emissions and addressing ways to minimize this impact by December 2010. The Commission will also develop a proposal containing a concrete methodology for GHG emissions caused by indirect land use changes.

Some European Member States have also established internal certification schemes for biofuels or other rules that will impact biofuel production and use. The Netherlands has created sustainability criteria for biofuels, extending what are known as the Cramer principles to biomass. The United Kingdom's 2007 Renewable Transport Fuels Obligation (RTFO) requires that five percent of all road vehicle fuel comes from sustainable renewable sources by 2010. The UK's Renewable Fuels Agency (RFA) monitors the carbon and sustainability credentials of biofuels using information provided by suppliers. Germany has developed a Biofuels Sustainability Ordinance, and an International Sustainability and Carbon Certification (ISCC) is in the works. In Sweden, a bilateral agreement has emerged between the biggest Swedish bio-ethanol importer and four Brazilian ethanol producers.

4. Criteria for an Effective Biofuels Certification System

Certification is a mechanism used to ensure that a product or process adheres to a given set of standards or criteria. Often performed by a third party, certification is a tool that can be used to reach an underlying goal. For example, certification schemes can work to ensure product safety or quality. Certification provides incentives for firms to behave in certain ways.

In recent decades, certification has become a popular tool in the environmental arena as a method to influence the environmental behavior of companies. Examples of environmental certifications include Leadership in Energy and Environmental Design (LEED) for buildings and U.S. Department of Agriculture's (USDA) National Organic Program for food products. Participants also considered the work of the Forest Stewardship Council and Rainforest Alliance as examples of third-party certification of farms, forestry, and tropical crops such as oil palm and sugarcane. Most of these processes are voluntary in that firms can still sell uncertified products.

In the case of biofuels, governments have established mandates on the percentage of qualified biofuels to be blended into conventional gasoline and/or sold. To be eligible, and meet the definition of a qualified biofuel, biofuels would have to meet environmental and social standards. The current debate is over what these standards should cover and how the certification processes should operate. Workshop participants discussed the elements of an effective biofuels certification system, described below.

4.1. *Match Targeted Instruments to Policy Goals:* Certification efforts must be clearly matched to specific goals. It is well-established that good policy generally needs as many different instruments or interventions as it has targets or objectives.[8] If biofuel certification is implemented, some say, it must clearly address a goal, and the goal must obviously link to the certification system. Because many governments have embraced biofuels in order to reduce greenhouse gas emissions, some argue that a biofuels certification system should help to ensure that these reductions are achieved. Certification should also serve to stimulate, as opposed to hinder, the production of advanced biofuels that emit less GHG emissions.

4.2. *Transparent Good Governance:* The process through which a certification system is developed is critical to its eventual acceptance and adoption—good governance is crucial. For example, to ensure that certification does not become an obstacle to international trade, sustainability criteria should be developed through a transparent and fair process where countries, both producing and consuming, are effectively represented. Biofuels standards need to be based on solid technical knowledge and stakeholders must see the certification process as legitimate. Some acknowledged the participatory processes developed by the Roundtable on Sustainable Biofuels (RSB) and the Global Bioenergy Partnership (GBEP) to define science based sustainability criteria and indicators for biofuels.[9] The RSB is open to all stakeholders, including consumers,

[8] As noted in the San Servolo report, these relationships were first articulated by Jan Tinbergen, *On the Theory of Economic Policy*, Amsterdam: North Holland Publishing, 1952, and elaborated by many others, e.g. A.J. Hughes Hallett, "Econometrics and the Theory of Economic Policy: The Timbergen-Theil Contributions 40 Years On," Oxford Economic Papers, vol 41, 1989, pg. 189-214.

[9] The Roundtable on Sustainable Biofuels is a multi-stakeholder initiative to develop standards for the sustainability of biofuels. The Roundtable is an initiative of the Swiss EPFL (École Polytechnique Fédérale de Lausanne) Energy Center. For more information see http://www.bioenergywiki.net/index.php/Roundtable_on_Sustainable_Biofuels.

companies, banks, and policymakers. The GBEP is a government-driven initiative open to policymakers and representatives of international organizations.

Some say there are too many initiatives to design sustainable biofuel standards, and an effort to converge these processes is needed. A single effort would offer the consistency and certainty necessary to establish an international market. Several participants suggested that the International Organization for Standardization (ISO) might be an appropriate institution to continue the drive to establish global standards.[10] However, others questioned passing the biofuels "hot potato" to a new organization, noting that doing so would require a costly and lengthy process.

4.3. *Verifiable and Enforceable:* Standards must be measurable and expressed in unambiguous language so that firms can satisfy the certification requirements, and their compliance can be verified. In addition, certifications must be enforceable—there should be costs for noncompliance.

4.4. *WTO Compatible*: An effective biofuels certification regime must be compatible with WTO agreements. Certification system must be non-discriminatory, applying to EU and U.S. domestic production as well as imports from developing countries. Stakeholders should ensure that any unilateral enforcement strategies in the certification system do not violate WTO rules.

Additional costs associated with certification could mean that small producers in developing countries would be unable to afford to comply with certification requirements and would be excluded from the marketplace. For this reason, the WTO's Technical Barriers to Trade (TBT) Agreement mandates members to take the special needs of these countries into account when preparing technical regulations and standards.

4.5. *Minimize Transaction Costs:* Any certification system should be easy to manage. To the extent possible, standards should be simplified and not impose unnecessary burdens on

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Launched in May 2006, the Global Bioenergy Partnership is a government-driven initiative that brings together public, private and civil society stakeholders in a joint commitment to promote bioenergy for sustainable development. For more information see www.globalbioenergy.org/

[10] The International Organization for Standardization (ISO), a network of national standards institutes from 161 countries, is the world's largest developer and publisher of International Standards. For more information see www.iso.org

producers. In many areas of regulation, certifiers may want to over-achieve, but a regulatory regime should only deal with what is necessary. As one participant put it, "We should not recreate an entire regulatory regime just for one product."

4.6. *Scaffolding Regulation:* Many workshop participants agreed that a "scaffolding" approach to biofuels regulation would be beneficial.[11] Scaffolding regulation means creating a flexible set of norms that can accommodate changes in the regulatory environment as well as uncertainties about the future of environmental regulation. In other words, regulations and certification for biofuels must be able to evolve as the market develops because the standards that are in place today will be different from those that exist ten years from now. For example, if a global carbon tax or a cap and trade system is developed at some future date, biofuels standards should be flexible enough that they can piggyback on that new system, rather than creating a double burden on the transportation sector.

5. Major Challenges in Biofuel Certification

One reason biofuel is difficult to certify is that it combines three sectors: agriculture, environment, and energy. An over-arching question that influenced the workshop discussion was: What is the role of certification in the context of biofuels? Is it to regulate products, inform consumers, or create a global market for biofuels? If the goal is to influence the behavior of firms, how can this be done? If the goal is to inform consumers in order to influence their behavior, how can this be accomplished?

5.1. Can We Design an Effective, Multi-purpose Biofuels Certification System?

Because countries have mandated the use of biofuels in part to reduce GHG emissions, governments want to ensure that the production and use of biofuels will indeed result in decreased emissions when compared to the use of conventional motor fuel. However, governments may also want to ensure that the production and use of biofuels will not raise the price of food, overuse or pollute water resources, increase deforestation

[11] The idea of "scaffolding" was presented in the draft paper prepared for the workshop by Ricardo Hausmann and Rodrigo Wagner, "Certification Strategies, Industrial Development, and the Making of a Global Market for Biofuels," April 30, 2009.

or despoil other environmentally valuable land, or violate social norms such as child or slave labor.

Can stakeholders design a multi-purpose set of standards and a certification process for biofuels that will address all of these concerns? Or are the concerns so numerous and broad that a single biofuel certification scheme cannot effectively deal with them all? As one participant put it, "are we trying to simultaneously shower and cook dinner just for efficiency's sake?" Alternatively, for biofuels to be eligible to qualify under a government mandated renewable fuel standard, they must be certified as meeting GHG emissions standards, but a second potential voluntary certification process could be established for other sustainability criteria, targeted to water, land use and social concerns.

For example, some want to use a biofuel certification scheme to protect high biodiversity grasslands, natural protected areas, and undisturbed forests. Others agree with these goals, but question whether a mandated biofuel certification scheme is the best way to protect these lands. Some are "puzzled" as to why so much effort is going towards biofuel certification when biofuel production represents just one of many ways land is used.

Could biofuel certification be used to help address deforestation? Some argue it should not, saying deforestation requires a broader policy instrument and needs to be regulated in its own right—not through the biofuels industry. Certification of one product is not the appropriate instrument to regulate land use, some say. A key question emerges: Do we want to certify products, or do we want to manage land use? To illustrate the point, one participant compared the problem of deforestation to the problem of child labor in the textile industry. Do you want to ensure that the shirt you are wearing is not made with child labor? If so, child labor may still be used to produce shirts for other consumers. Isn't it better to ensure that child labor is not used at all? Deforestation elicits a similar set of questions. Do you want to ensure that biofuel production does not result in deforestation? Or do you want to manage deforestation more generally, as it pertains to all industries?

Biofuel production is just one of many agricultural uses of land, and some say it is not fair to put such a burden on biofuels production. Would ensuring that biofuels do not result in deforestation have an impact to justify the effort and expense? Furthermore, some argue that it does not make sense to certify biofuels for deforestation because it is not the biofuel industry that moves into forested areas—it is low infrastructure farming,

cattle ranching, timber extraction, and the opening of access routes to forested areas by logging operations.

While many would agree that issues like land use need to be regulated in their own right, others argue that it does not follow that biofuel certification ought not to consider land use implications. Certifying that a product does not use child labor (as RugMark does for the textile industry) is not a means to end child labor. It is a way to communicate to a consumer that the product she purchased did not contribute to child labor. This does not preclude that same consumer (or organization) from protesting in countries using child labor, or putting pressure on retailers to divest from notorious producers.

Products are already being certified to reduce deforestation—shade-grown coffee is one example. Some of the Rainforest Alliance's agricultural certifications include a principle related to reducing or eliminating deforestation in the tropics. The Roundtable on Sustainable Palm Oil is also focused on deforestation. Can governments ignore the risk of biofuel feedstocks displacing forest or grazing land? Since deforestation releases greenhouse gases, this directly undercuts a primary goal behind government mandates for biofuel use—reducing GHG emissions. In the Amazon, only four percent of land has clear title, "which is like putting out a welcome mat," as one participant put it. Under today's incentive schemes, a standing tropical forest has limited value, but cut down, both the land and the trees may be valued in the marketplace. Thus, some say, certification processes should work to ensure that biofuels will not cause deforestation or environmentally unsustainable land use changes as well as reduce pressure on world food prices (that may in turn trigger deforestation). Incentives could give non-food biofuel feedstocks preferential treatment and favor currently non-productive land over agricultural land.

What complicates the debate is the reality that a biofuel that does not qualify as a "mandated renewable fuel" is not likely to be purchased. Then certification takes on a regulatory role. While goals outside of GHG emissions reductions, such as protection of biodiversity, are legitimate, reducing GHG emissions is the primary purpose of the legislated mandates and targets. Thus it is legitimate for governments to mandate that biofuels meet GHG emissions goals, but other concerns may be best served by more traditional voluntary certification schemes.

5.2. What Type of Approach Should be Used to Certify Biofuels?

Workshop participants discussed possible models.

5.2.1. *Mandatory or Voluntary?* Certification systems can be mandatory or voluntary. As discussed above, mandatory schemes must be complied with in order to count biofuels towards national or regional targets. These certification systems have to be WTO-consistent because they impose legal obligations on domestically produced and imported products.

As an increasing number of firms embrace the concepts of corporate social responsibility, voluntary certification schemes are being adopted, especially in markets where consumers pay special attention to product characteristics, such as sustainability. Firms participate in voluntary certification for a variety of reasons, including protecting their reputation, differentiating their product, improving the company brand, improving operations, avoiding mandatory regulation, and providing information to consumers or business partners. Examples of voluntary global regimes include ISO 14000 and Responsible Care (in the chemicals industry). The legal treatment of voluntary certification schemes, especially those developed by hybrid entities such as the Roundtable on Sustainable Biofuels (RSB), remains unclear under WTO law. Participants noted that for biofuels, the UK's Renewable Transport Fuels Obligation (RTFO) is one example of legislation which recognizes voluntary biofuel certification.

Is it possible to establish a value for voluntarily certified biofuels? In other words, will consumers pay a premium for biofuels that meet sustainability standards? Some argued that this line of questioning is not relevant to the biofuels discussion, since few certified products will exhibit a price premium. The reason producers will get certified, some said, is to achieve long-term or preferential access to markets, not to inform consumers, thus a voluntary system may not as effective as proponents claim.

5.2.2. *Countries or Firms?* One question that emerged in the discussion is if biofuel certification should occur at the country or firm level. Some believe that biofuels should be regulated at the firm level because entrepreneurs are more likely to

successfully navigate international certification processes than over-burdened, weak national governments in developing countries. As one participant put it, "We want to promote development in spite of the fact that governments underperform." Certification capacity should be importable, since NGOs or other private entities could perform certification even if governments do not have the ability to do so. (For a comparable effort, consider EUREPGAP, a private body that sets voluntary standards for the certification of agricultural products.) Firm level certification could also reduce customs complications because governments would not need to certify products at the border. Finally, some noted that in the UK, and the U.S. EPA and California biofuels proposals, the certification responsibility falls to the importer as opposed to the government or the producer. This means that importers would bear the burden of coordinating certification efforts and ensuring that producers in exporting countries meet the required standards. Under such a scheme, the role of country governments is reduced.

Certifying at the country level might give the wrong incentives to firms, some believe, creating the temptation for companies to free-ride on the country's certification. National certification could also exclude efficient producers in countries with weak state capacities that are unable to get certified. In addition, certifying at the national level could create opportunities for corruption and uncertainty in the investment climate. If the level of uncertainty is too great, it could even kill the industry, some said. In short, certification should pose as unintensive a regulatory burden on the state as possible.

Some pointed out that certifying the firm could work in some contexts, but not in others. For example, in Brazil, certifying at the firm level could be very effective, especially with UNICA, the Brazilian Sugarcane Industry Association, already in place. But would this approach work elsewhere?

Others questioned the overall strategy of certifying at the firm level, believing that ultimately, it is important to certify biofuels at the national level to not undermine the role of the state. In addition, in order to effectively certify green house gas emissions, all countries must participate in order to avoid leakage. Therefore the locus of responsibility under a global climate protocol will be the national government. Some disagreed with the use of the term "leakage" in this

context, noting that while all countries must participate in climate change mitigation measures to avoid leakage, biofuels production is only a small piece of this overall effort. A third alternative would be to start with placing the responsibility for certification at the firm level and then after a certain number of years move to a system of country certification.

Finally, participants discussed at what point in the supply chain certification should occur. Should the refiner or importer be certified? Or should labeling take place at the pump?

5.2.3. *Who Should Certify?* Should biofuel standards be set at a national, regional, or global level? Some argue that an effective biofuel certification regime must be global, saying that consistent, mandatory, global standards which link the certification instrument to the desired outcome will create a level playing field for competition. Ideally, some say, a system of standards should be reached through an international agreement under the auspices of the United Nations. Concluding an international agreement would be difficult, but the Roundtable on Sustainable Biofuels (RSB) and the Global Bioenergy Partnership (GBEP) have made progress in reaching some consensus views.

5.2.4. *Fuel or Feedstock?* The primary biofuel feedstocks (such as corn, sugar, and oil seeds) have a variety of end uses. For example, in addition to being used as a feedstock for EU biodiesel, palm oil is used in foods and cosmetics. The oil seed market is a mature market. Should governments restrict the importation of biodiesel made from seeds unless its production processes are certified as sustainable, but insist on no similar process if the oil is used to produce other products? Should we certify palm oil as a fuel, or certify the production of palm oil regardless of its end use? Participants suggested that policymakers explore feedstock-specific certification schemes such as the Roundtable on Sustainable Palm Oil, the Roundtable on Responsible Soy Association, and the Better Sugarcane Initiative.

These schemes cover all end uses of the crop in question as opposed to only one use.[12]

5.3. Measuring Greenhouse Gas Emissions

Currently, one of the most challenging questions in the debate over biofuels is how to measure greenhouse gas emissions released in biofuel production. For example, how should nitrogen emissions from fertilizer application be taken into account? How should the creation of co-products, where more than one product is created as a result of biofuel production, be considered in the calculus? There is also variation in the methodologies that can be used to calculate GHG emissions. Areas of uncertainty include the use of default values where data is not available, leading to concerns about the validity of GHG calculations. What assumptions are being made to create these default values?

A major question is if biofuel certification processes should include indirect land use effects when determining GHG emissions. If indirect land use effects are included, this means that in addition to considering GHG emissions from fertilizer and tractor fuel, certifiers would also consider emissions produced when farmers across the globe clear land (such as carbon-capturing forests) to grow crops needed to replace food and feed supplies that have been diverted to biofuels.

Critics argue that efforts to include indirect land use in biofuel certification have moved far ahead of current science, saying that the methodology of estimating emissions from land conversion is too uncertain to use in regulation. Certification schemes must be measurable and verifiable, but some say that with current methods it is not possible to verify and link indirect impacts to one particular source at the firm or farm level. Furthermore, the varying models and data on GHG emissions through a biofuel's lifecycle can yield very different results, even for the same crop from the same country. Some strongly support the inclusion of indirect land use changes in lifecycle GHG emissions accounting. Proponents assert that to ignore indirect land use changes because of methodological shortcomings would be contrary to governments' obligation to ensure that biofuels mandates do not result in even greater GHG emissions. Certification schemes

[12] For more information, see http://www.rspo.org/, http://www.responsiblesoy.org/, and http://www.bettersugarcane.org/

could also provide incentives for firms to reduce indirect impacts, such as working toward yield intensification and greater use of "degraded" lands.

In May 2009, the U.S. EPA issued draft rules on the 2007 Renewable Fuels Standard. These rules consider indirect land use in the GHG emissions methodology (the EPA was required by Congress to consider the lifecycle emissions of biofuels, including the indirect effects). The EPA modeled greenhouse gas emissions for a variety of fuels over a 30 year period and a 100 year period.[13] Using a 30 year period, the GHG emission contribution of indirect land use dominates for most bio-based fuels. With the longer time frame, however, the land use change has less of an impact, because the initial change is balanced out by the GHG emissions savings of the biofuels (when compared to gasoline). For example, under the 30 year model, corn ethanol (natural gas dry mill), releases five percent more GHG emissions than conventional gasoline; in the 100 year model, it releases 16 percent less GHG emissions than conventional gasoline.[14] Another important variable in the emissions model is what type of land is impacted by biofuel production: is it high carbon land (such as forests) or low-carbon areas (such as savannahs)?[15]

Some question the assumptions used by the EPA when modeling the 30 and 100 year time horizons, adding that the models do not take important variables into account such as future innovations that will increase yields on existing land. Some argue that the EPA models are based on current policies and assume that no policy changes are introduced in the future, including, for example, an effective GHG emissions initiative such as a cap and trade program. Others worry that the models' variables were derived from top-down analysis, performed far away from where biofuels are grown or processed, and thus do not take into account actual practices.

In addition to the EPA's efforts, the California Air Resources Board (CARB) adopted a Low Carbon Fuel Standard (LCFS) which requires a 10 percent reduction in greenhouse gas emissions per unit of energy for gasoline and diesel fuel (as opposed to mandating the use of a particular fuel, like the RFS). The LCFS approach also accounts for indirect land use emissions. According to the CARB methodology, corn-based ethanol does not meet the standard because using corn for fuel increases deforestation and loss of grasslands (the

[13] See http://www.epa.gov/otaq/renewablefuels/420f09024.htm
[14] See http://www.epa.gov/otaq/renewablefuels/420f09024.htm
[15] For more information on the proposed rule for the US Renewable Fuel Standard (RFS2) and supporting documents, see http://www.epa.gov/otaq/renewablefuels

CARB model attributes about 30 percent of corn ethanol's emissions to land use changes). This controversial analysis could have broad implications for the future of conventional biofuels.[16]

In the United Kingdom, land use change is monitored as part of carbon reporting for biofuels under the Renewable Transport Fuels Obligation (RTFO). In the current format for carbon reporting, obligated parties report land use change history, if known, which is incorporated into the carbon emissions calculation using default values from Intergovernmental Panel on Climate Change (IPCC) guidelines. If land use history is unknown, the methodology does not use a default calculation. Instead, it is the ongoing role of the Renewable Fuels Agency (RFA) to monitor developments on the implications of biofuels produced from these "unknown" sources.[17]

5.4. Can We Create a Global Biofuels Market?

The world has significant untapped agronomic potential for biofuel production, which is concentrated in a subset of developing countries that have the right growing conditions for biofuel feedstocks. However, in order to stimulate a significant investment in these countries, it is necessary to create a global market for biofuels. The current global market is limited in size, with most of the biofuel supply coming from Brazil.

Some worry that biofuel certification processes will be created before optimizing the industry, slowing or even halting industry development before it really begins. For example, complex certification schemes could create an administrative burden on fuel suppliers, discouraging industry participation.

Other challenges to building a biofuels industry in developing countries include the unbundled nature of vertical relationships between producers, processors, and distributors, which make investment at any point in the chain risky. Sugar ethanol requires more local processing than other agricultural crops, such as soybeans. Sugar cane must be processed within 30-50 kilometers of the area where it is farmed, so transportation networks are needed to properly process the crop.

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[16] For more information see Dan Charles, "Biofuels: Corn-Based Ethanol Flunks Key Test," *Science*, Volume 324, May 1, 2009, p. 587.

[17] For more information see http://www.renewablefuelsagency.org/_db/_documents/Carbon_and_Sustainability_Guidance_Part_1.pdf

Some argue that in fact, there may be little appetite in developed countries to work towards the development of a biofuel industry in the developing world. The domestic drivers that led developed countries to mandate biofuel use, such as reducing GHG emissions, enhancing energy security, and supporting domestic farmer incomes, do not necessarily translate into enthusiasm for the development of a global market. In addition, in the United States it is difficult to focus on developing a biofuels industry in poorer countries when the U.S. ethanol industry has a large capacity, but is struggling to remain profitable. Yet, if biofuels are imported to meet the growing demand for liquid fuels in a climate constrained world, developed countries may be short-sighted if they ignore the vast potential inherent in many tropical countries in Latin America, Africa, and Southeast Asia.

Conclusion

The debate surrounding the design of biofuel certification processes is unlikely to dissipate anytime soon. In a world constrained by the threat of climate change and worried about the future availability and price of energy supplies, biofuels remain one of the only viable alternatives to conventional oil products to meet a portion of the future market for liquid transportation fuels. Simultaneously, concerns about increased GHG emissions, loss of forests and biodiversity, and the fear that farmers will be unable to meet the growing demand for food at prices people can afford are likely to grow in volume and intensity. If pushed too vigorously, certification schemes could reduce the potential of biofuels, but if targeted at a specific and limited set of problems and designed with flexibility, certification can enhance the public's acceptance of the biofuel option while protecting key environmental goals.

Appendix A: Participants

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