



“Unbundling” the biofuel promise: Querying the ability of liquid biofuels to deliver on socio-economic policy expectations

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ABSTRACT

While excitement around biofuels initially focused on finding a clean and secure alternative to fossil fuels, many other expectations have subsequently been attached to the “biofuel boom.” Biofuels are not only expected to mitigate climate change or foster domestic energy security, but also to generate employment, provide opportunities to smallholders and support decentralized energy systems. This paper interrogates the expectations attached to biofuels. We begin by examining how policies in consumer and producer countries articulate a series of expectations for biofuels that are “bundled” with the promise of cleaner energy, using the rationales behind these expectations to derive criteria for success. We then review evidence from the published literature on biofuel outcomes against these criteria to assess whether the most prevalent assumptions have been met. We find that policy expectations for biofuels are often expressed in narrow terms, failing to capture important potential impacts – for example focusing on new jobs in the formal sector rather than job quality or whether employment offsets livelihood costs associated with biofuel investments. Some expectations have proven elusive irrespective of the metrics employed, for example using biofuels to improve energy access in remote rural areas. The paper concludes by discussing implications for policy and practice.

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1. Introduction

While assumptions of climate neutrality were a key discursive driver of the recent “biofuel boom” (Searchinger, this issue), a host of additional expectations were quickly attached to liquid biofuels as different actors sought to capitalize on the opportunity to achieve other social, economic and environmental goals. Positive discourses about biofuels rest on the assumption that producing and using biofuels can achieve several goals simultaneously, such as enhancing energy security, job creation, and rural development. Such “bundled” expectations appear in biofuel policies around the world – policies that have played a critical role in promoting the expansion of biofuels by setting fuel blending targets, creating financial incentives for producers, and funding research and development (Bailis and Baka, 2011; Hall et al., 2009).

But can biofuels meet these multiple objectives? Key claims related to the benefits of biofuels have been questioned, with greenhouse gas balance receiving particular scrutiny (Fargione et al., 2008; Searchinger et al., 2008, Searchinger this issue). Other critiques include concerns over perceived competition between food and fuel production (Thompson,

2012; Zilberman et al., 2012), local land rights (Cotula et al., 2008; White and Dasgupta, 2010), and labour issues (Labruto, 2014). Previous work finds that the social protection measures in biofuel policies and sustainability certification schemes are particularly weak (German and Schoneveld, 2012a; Hunsberger et al., 2014), while Europe’s “hybrid governance” approach allows producers to choose between standards that vary considerably in their comprehensiveness and rigour (German and Schoneveld, 2012a), enabling a ‘race to the bottom’ that evidence suggests is already underway (Ponte, 2014, de Man and German, this issue).

Despite these critiques, the “biofuel promise” – the expectation that biofuels can achieve a suite of social, economic and environmental goals – remains influential in guiding policy. There is thus a need to query the evidence on whether positive aspirations for biofuels are being met on the ground. This paper aims to fill this gap by “unbundling” policy expectations linked to biofuels and reviewing evidence on whether each one has been achieved. We focus on first-generation, crop-based liquid fuels – the basis of many biofuel policies – because they have been pursued long enough and are well enough established to assess to what extent and under what conditions the

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aims of these policies have been met. While others have approached the task of reviewing the performance of biofuels (Clancy, 2013; Creutzig et al., 2014; German et al., 2011b; Robledo-Abad et al., 2016), our study extends this work by evaluating the impacts of biofuels in relation to the policies that played such a crucial role in promoting them. The question guiding this analysis is, “To what extent have biofuels delivered on expectations commonly attached to them, aside from climate change mitigation?” This study is designed to complement two other papers in this collection: one that assesses biofuels’ climate change mitigation potential (Searchinger, this issue), and another that investigates the extent to which negative effects on food security, land rights and the environment have been avoided (Goetz et al., this issue).

The paper proceeds as follows: Section 2 explains our methods, including the selection criteria for countries and policy documents. Section 3 develops operational definitions for the most consistently mentioned expectations in these documents – drawn as much as possible from the policies. Section 4 presents a targeted literature review that assesses outcomes for four expectations: energy security, employment creation, smallholder inclusion and decentralized energy systems. Section 5 reflects on implications for policy and practice.

2. Methods

The research followed a five-step process:

1. Selecting a diverse set of countries with bioenergy policies;
2. Identifying core expectations raised in policy documents from the selected countries to find the most prevalent themes;
3. Deriving assessment criteria for each theme based on rationales expressed in policies, and where necessary, also drawing on international standards or literature;
4. Assessing published evidence of outcomes for each theme using the criteria derived in step 3;
5. Reflecting on whether the criteria derived from policy documents are sufficient to assess outcomes for each expectation and how they could be improved.

While many state and non-state actors were involved in formulating and propagating discourses of potential benefits of biofuels as well as the governance instruments that have emerged to govern their effects (Bailis and Baka, 2011), we focus our review on expectations enshrined in government policies in key producer and consumer countries/blocs. We justify this focus on policies on two grounds. The first is a question of accountability: any effort to evaluate actual impacts against expectations should consider what outcomes actors are aiming for, and accountable to. This is best evaluated from the perspective of policy aims officially endorsed by nation-states. The second is a recognition that non-state actors, including industry lobbies and civil society, have heavily influenced existing policies – suggesting these policies reflect the intersection of multiple sets of interests (Bailis and Baka, 2011; German and Schoneveld, 2012b). In selecting policy documents we sought to include countries with diverse characteristics including key producers and consumers of biofuels, countries with earlier biofuel policies and more recent adopters, while aiming for a sample of countries at different levels of industrialization and from diverse world regions (Table 1).

A close reading of the selected documents yielded a summary of expectations raised across the documents. The results, compiled in Table 2, highlight the key policy aims linked to biofuels in 11 countries. As the table shows, while emissions reduction is a nearly universal aim, many additional expectations have been “bundled” with climate mitigation expectations. Expectations related to avoiding negative outcomes are explored in a companion paper (Goetz et al. this issue).

Five expectations stand out as particularly prominent across the countries reviewed:

1. Domestic energy security
2. Job creation
3. Smallholder inclusion
4. Decentralized energy systems
5. Rural development

Given their prevalence, we chose the expectations as the focus of our analysis – however, rural development proved too difficult to assess as a coherent category due to widely differing interpretations (discussed further below). Section 3 explains how the policy documents defined and operationalized the core expectations and how we in turn derived criteria for assessing outcomes for each one, drawing as closely as possible on terms used in the selected policies.

To evaluate empirical evidence of outcomes we conducted a targeted literature review, focusing on empirical work published within the last 10 years (since 2006). The start date of 2006 reflects a year in which biofuels production and consumption increased rapidly worldwide – both in terms of world production of fuel ethanol, the main form of biofuel, and technical innovations in biofuels (Albers et al., 2016). As far as possible, we matched evidence on outcomes for each expectation with the countries and regions whose policies expressed those expectations. For example, all the focal countries identified energy security goals, so all are included in the discussion of energy security outcomes. On the other hand, expectations related to job creation, smallholder inclusion and decentralized energy systems were expressed by focal countries in the global South (plus the EU, whose 2009 policy acknowledges the need to import biofuels to meet use targets), but not by the UK or US – so our review of evidence on these expectations focuses on studies from the global South, drawing in findings from additional countries to increase the available evidence. While we initially intended to restrict our search to articles sourced through Web of Science and Scopus, for some themes these databases proved too limited, and we expanded our search to Google Scholar or even Google (for example, to identify specialized datasets). Table 3 summarizes the literature search process, including the search terms used.

The volume of evidence made it impossible to tackle all policy expectations in depth within a single paper. We focus on four of the most widely mentioned expectations related to benefits that biofuels are supposed to provide. Recent evidence on greenhouse gas emissions is reviewed in a separate paper (Searchinger, this issue), as are policy statements and outcomes related to mitigating anticipated risks of biofuels (Goetz et al., this issue). Further in terms of scope, we focus on crop-based sources of liquid biofuels. Recognizing that most biofuel feedstocks can be considered ‘flex crops’ due to their multiple possible uses (Borras et al., 2015), we include in our analysis crops that can be used for food (corn, sugarcane, cassava, soy, oil palm) as well as some that cannot (jatropha, castor).

3. Bundling the biofuel promise: expectations in national biofuel policies

3.1. Clarifying policy expectations

To assess outcomes related to each expectation, we must: (i) understand what is meant by each expectation and the degree to which different countries are aiming for the same things; and (ii) distil indicators linked to these policy expectations against which the evidence will be evaluated.

3.2. How expectations are defined or operationalized within focal countries

3.2.1. Domestic energy security

The International Energy Agency defines energy security as “the uninterrupted availability of energy sources at an affordable price,” identifying three components: accessibility (available supply), afford-

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