

Mandating Food Insecurity: The Global Impacts of Rising Biofuel Mandates and Targets

Timothy A. Wise and Emily Cole¹

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Executive Summary

Expanding demand for biofuels, fed significantly by government policies mandating rising levels of consumption in transportation fuel, has been strongly implicated in food price increases and food price volatility most recently seen in 2008 and 2011-2012. First-generation biofuels, made from agricultural crops, divert food directly to fuel markets and divert land, water and other food-producing resources from their current or potential uses for production of feed for animals and food for human consumption.

A wide range of international bodies, including the World Bank, the United Nation's Committee on World Food Security, and a landmark report prepared by G20 countries, has called for reforms to government policies that encourage the continued expansion of first-generation biofuel production. Unlike second-generation biofuels, which are less likely to compete with food crops for land and other resources, first-generation biofuels such as corn ethanol, soy and palm biodiesel, and sugarcane ethanol dominate the current global biofuels market.

In this paper, we document the global spread of the most widespread government support policies for biofuels: consumption mandates, with a particular focus on first-generation biofuels. These policies generally mandate the incorporation over time of a rising share or volume of biofuel into a country's transportation fuel. The U.S. Renewable Fuel Standard (RFS) is one such example, as is the European Union's (EU) Renewable Energy Directive (RED). Sixty-four countries now have biofuel mandates that reflect a wide range of ambition but that all encourage the use and usually the expansion of biofuel use.ⁱ

We show the current national and regional mandates (focusing on first-generation biofuels mandates) in place at this writing, assess the extent of their implementation based on available data, and estimate to the extent possible the implications of likely implementation. Using a range of projections from international agencies for comparison, we gauge the extent to which current mandates will expand future levels of biofuel consumption and production by 2025.

We find that the projected expansion of biofuels, and the resulting demands on food, land, and water, is indeed worrisome. Today we live in a world where twoⁱⁱ to threeⁱⁱⁱ percent of transportation fuel is accounted for by biofuels (depending on the source one uses). Biofuels in the largest biofuel-producing countries, such as the United States and Brazil, comprise

¹ Timothy A. Wise is the Director of Policy Research and Emily Cole is a Researcher with the Global Development and Environment Institute at Tufts University. They would like to thank Sheila Karpf for her invaluable editorial assistance. The paper benefited from review by several experts, who remain nameless here. All errors are, of course, the responsibility of the authors.

approximately 9% and 22% of gasoline and diesel blends consumed in each country, respectively, while most other countries' fuel supplies contain smaller percentages of ethanol and biodiesel.

The most commonly cited scenario from the International Energy Agency (IEA) projects a 150% increase in first-generation biofuel use by 2035. The agency estimates that 8% of transportation fuel (by volume) would come from biofuels,^{iv} with four-fifths of this expected to come from first-generation sources and just one-fifth from the assumed development of cellulosic ethanol and other second-generation biofuels produced from feedstocks that result in less competition for food and land.^v IEA thus estimates that roughly 6% of transportation fuel would come from first-generation biofuels in 2035.^{vi}

Other international agencies estimate lower rates of expansion, and those are more consistent with our estimates based on current mandates and targets. The Organization for Economic Cooperation and Development and the UN Food and Agriculture Organization (OECD/FAO), for example, suggest a 50-60% increase in ethanol and biodiesel consumption over the next ten years.^{vii}

According to our estimates of global mandates for seven major biofuel-consuming countries (the United States, EU, Brazil, Argentina, China, India, and Indonesia), first-generation biofuel consumption could be expected to grow 43% over its current levels if existing mandates are fully implemented. This means the world would be blending 3-5% of first-generation biofuels into domestic fuel supplies by 2025.

These estimates are indeed worrisome, though they fall well short of the IEA estimates of a world with 8% of transportation fuel being derived from biofuels. This should bring little comfort to those concerned with the food, feed, land, and water demands of continued first-generation biofuel development. A 43% increase over current levels would likely require 13-17 million hectares more land than we are currently already devoting to biofuel production and approximately 145 billion more liters of water (assuming biofuels production requires roughly the same amount as current U.S. corn ethanol production).^{viii} A more detailed quantitative assessment of these impacts is much-needed to evaluate the specific impacts in different regions and countries under different scenarios.

What's more, the policies (and data) remain uncertain in several large developing countries, most notably China and India. We have good reason to believe that both will experience relatively limited expansion of first-generation biofuel use, but any large-scale commitment to first-generation biofuel development in these countries would have a dramatic and devastating impact, whether the feedstocks or fuel are sourced domestically or imported.

In addition, we find:

Mandates Are Key Drivers

- The number of countries with consumption mandates has risen to 64 and is continuing to grow.
- OECD mandates will continue to be the real drivers of biofuels demand, with the United States and the European Union projected to account for roughly 60% of global biofuel consumption in 2025, and nearly 50% of projected new biofuel consumption.

- Most mandates are based on percentage shares of consumption, rather than volumes as in the United States. The mere growth in demand for transportation fuels, due to economic growth and the rise in the prevalence of private automobiles, particularly in large, fast-growing developing countries, can be expected to account for a 16% rise in biofuel consumption over current levels.
- An oversupply of palm oil production in supplier countries like Indonesia, partially caused by EU mandates, has contributed to more ambitious consumption mandates in Indonesia.^{ix} Indonesia shows the most ambitious targets and the most dramatic growth in first-generation biofuel consumption among developing countries, contributing to an already-serious deforestation problem.
- Full implementation of mandates is by no means certain. In India, for example, ethanol targets were recently scaled back from 20% to 5% because the country has lagged in sugar production to provide the necessary feedstock. India is now blending only about 2% ethanol into its transportation fuel supply. India also has a 20% biodiesel target, but there is good reason to doubt it will meet such a goal.^x

Trade is a Major Driver

- Brazil is a major producer and consumer. Economic growth will drive rises in domestic consumption, but ethanol exports are also expected to increase depending on market and trade conditions. The United States is also seeking to expand its ethanol exports.
- Mandates are driving growing ethanol trade, in perverse ways. Brazilian sugar ethanol is imported by the United States to fulfill its mandates for advanced biofuels, while the United States has sometimes exported corn ethanol to Brazil to make up for losses to the Brazilian domestic market.
- Prior to Dec. 2011 when the U.S. ethanol tax credit and tariff were eliminated, Caribbean Basin Initiative (CBI) countries received preferential treatment in the U.S. ethanol market. The Central American Free Trade Agreement allowed Brazilian ethanol to be dehydrated in CBI countries and then exported to the United States.^{xi}

Significant Technological and Policy Uncertainty

- China is the biggest wild card in these projections. With a mandate that covers just nine provinces now, China is blending only 1.1% biofuel into its transportation fuels, and that is not expected to grow appreciably. The government has been sensitive to the food-fuel competition in its policies to date, but the country's demand for transportation fuel is projected to grow dramatically, creating strong incentives for the government to promote consumption. Any expansion of China's biofuel consumption would have global repercussions, particularly if China relies on imported feedstock or fuel to meet such mandates.
- The emergence of potentially more sustainable non-food-based, second-generation biofuels and implementation of sustainability standards could alter these estimates considerably if the technology and commercial applications proceed more quickly than currently projected. Public research and incentives for second-generation biofuels may help jumpstart the industry beyond its current small scale, but much is still unknown.
- Second-generation biofuels could be no better than first-generation fuels if they displace land or other resources from other productive uses.

Recommendations

Our analysis suggests the need for governments to cease the implementation and expansion of current food-based biofuels consumption mandates and to forgo the creation of new mandates. Mandates prop up demand for biofuels, particularly at times when oil prices are relatively low. Governments and international bodies should also eliminate perverse incentives such as biofuels subsidies for first-generation biofuels that impact the food supply.

Proposed reforms to U.S. and EU mandates are welcome and needed. The EU proposal to limit first-generation biofuels to 7%, within the EU's 10% mandate, would reduce the EU's contribution to global biofuel expansion by 50%.

The United States would do well to consider similar reforms. The United States is expected to remain by far the largest global consumer of first-generation biofuels in 2025, contribute the most to global consumption, and do so using the feedstock – corn – that provides the fewest environmental benefits and most directly competes with food and feed markets. Even a modest reform, such as that proposed by the Environmental Protection Agency in 2013 to scale back the mandate, would reduce projected consumption growth in 2022 by one-third.

Mandates must be scaled back further, and strict sustainability criteria must be applied to mandates for both first and second-generation biofuels. Otherwise, governments are mandating not just biofuel consumption but hunger and unsustainable resource use.

The full paper is available at:

http://www.ase.tufts.edu/gdae/policy_research/BiofuelMandates.html

ⁱ Jim Lane, "Biofuels Mandates Around the World: 2014 : Biofuels Digest," December 31, 2013, <http://www.biofuelsdigest.com/bdigest/2013/12/31/biofuels-mandates-around-the-world-2014/>.

ⁱⁱ Ivetta Gerasimchuk et al., *State of Play on Biofuel Subsidies: Are Policies Ready to Shift?* (International Institute for Sustainable Development, June 2012), 10, <http://www.iisd.org/gsi/biofuel-subsidies/biofuels-state-play-2012>.

ⁱⁱⁱ Daryl Brown, "IEA's World Energy Outlook 2013: Renewables and Natural Gas to Surge Through 2035," *Power* 158, no. 1 (January 2014): 204.

^{iv} *Ibid.*, 197.

^v *Ibid.*

^{vi} *Ibid.*

^{vii} *OECD-FAO Agricultural Outlook 2014-2023: Biofuels* (OECD/FAO), accessed August 2, 2014, http://stats.oecd.org/Index.aspx?datasetcode=HIGH_AGLINK_2014. 119.

^{viii} <http://web.extension.illinois.edu/ethanol/wateruse.cfm>

^{ix} R. Thomson Wright and I Edy Wiyono, *Indonesia Biofuels Annual* (USDA Foreign Agricultural Service: Global Agricultural Information Network, July 1, 2014), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Jakarta_Indonesia_6-27-2014.pdf.

^x Amit Aradhey, *India Biofuels Annual* (USDA Foreign Agricultural Service: Global Agricultural Information Network, July 1, 2013), http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_New%20Delhi_India_7-1-2014.pdf.

^{xi} http://www.iatp.org/files/451_2_73253.pdf