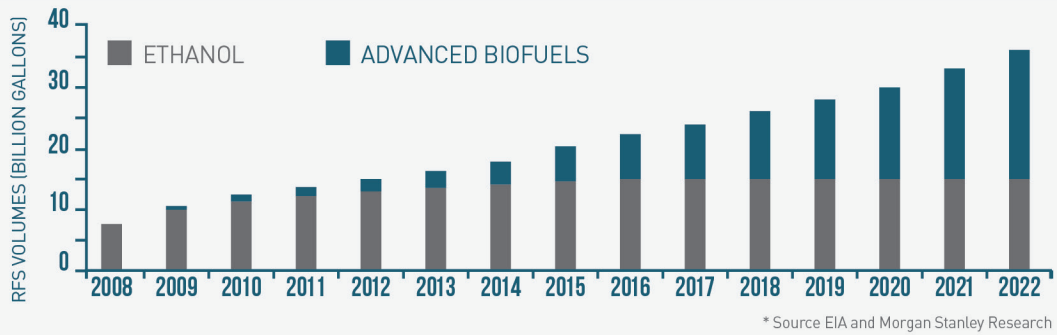
ADVANCED BIOFUELS: A RENEWABLE RESOURCE ON THE HORIZON

Global oil and food systems are both operating near full capacity, and demand is on the rise. As a result, rising prices are hurting Americans today, and the United States is at risk of food and fuel shortages in the future. To help head off an impending food and fuel crisis, it is necessary to lower the demand for oil.

The U.S. uses a lot of oil and imports most of it—almost 6 million barrels a day. Fully 70% of this oil is used for ground transportation, so Sustainable America has chosen to focus on decreasing the amount of oil Americans for transportation by 50% by 2035. Sustainable America believes that advanced biofuels, particularly those made from cellulosic materials (such as agricultural waste or switchgrass) and from algae hold promise as a source of energy that could reduce the country's dependence on foreign oil replace it with renewable, homegrown energy.

The Problem With First-Generation Biofuels. At approximately 567,000 barrels per day of biofuel production, the U.S. is the world's leading producer of first-generation biofuel (mainly ethanol and biodiesel).[1] The amount of ethanol consumed (as a blend into E85 gasoline) rose 105% in the 2006-2010 period[2], spurred on by the government-mandated renewable fuel standards (RFS). A second government mandate, called RFS-2, requires that advanced biofuels enter the fuel supply in increasing amounts from 2013 onward. The mandate was intended to spur on the development and adoption of advanced biofuels, but unfortunately, large-scale commercial production is not yet ready. The difference is likely to be made up with more corn-based ethanol. With available cropland already being farmed near maximum capacity, expanded corn demand could drive other crop prices up and continue a disturbing trend of America's grasslands being converted to corn crops, which poses serious environmental implications.

RFS VOLUMES GROW ANNUALLY (BN GALLONS)



* Source EIA and Morgan Stanley Research

The Benefits of Advanced Biofuels.

- **Increased food supply:** Unlike so-called "first-generation biofuels" like corn- or sugar-based ethanols, advanced biofuels are not produced from food crops, which means they would help loosen the linkage between our food and fuel networks and replenish historically low food stocks at a time when demand for food is on the rise globally.

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Food Waste Solutions
Alternative Farming
Precision Agriculture
Natural Gas Vehicles
Electric Vehicles
Fuel Efficiency
Advanced Biofuels

[1] BP Statistical Review of World Energy 2012

[2] EIA data: Estimated Consumption of Vehicle Fuels in Thousand Gasoline Equivalent Gallons, by Fuel Type, 2006 - 2010

- **Cleaner fuel:** The renewable and domestically grown advantages of biofuels over fossil fuels are clear by definition. While biofuels are generally considered cleaner than fossil fuels, exactly how clean has become a matter of debate in the scientific community; studies estimate anywhere from a 20% to 80% reduction in carbon emissions, depending on the feedstock and production method used.[3] Advanced biofuels are generally expected to fare better than first-generation biodisel in terms of emissions. A study by European oil industry-funded research body CONCAWE puts the greenhouse gas emissions savings of advanced cellulosic-based biofuels at 90% compared with traditional fossil fuels.

Challenges of Advanced Biofuels.

- **Still in developmental stages:** Only a handful of commercial-scale advanced biofuel ventures ready for wide use. As of 2012, there were 25 operating next-generation biofuels pilot/demo plants in the U.S., comprised of: 18 cellulosic ethanol plants; 5 renewable diesel plants; and 2 for biogasoline or biojetfuel.[4] Two operating commercial plants (Gevo and Dynamic Fuels) are now producing 18 million gallons per year of butanol and 18 million gallons per year of renewable diesel, respectively.
- **Blend wall:** Our current vehicle fleet, with most models engineered to run on a maximum of 10-15% ethanol per gallon, presents a barrier to wider usage of advanced biofuels, as each gallon of gasoline, on average, already contains about 10% ethanol. This phenomenon, known as the "blend wall," will put first-generation and advanced biofuels into competition with each other unless new car models are designed to run on yet higher mixes of biofuels.
- **Environmental impacts:** Biofuels do have a carbon footprint associated with them, and widespread production of certain forms of biofuels could create a host of potential unintended consequences, such as a lack of crop diversification, high levels of water and fertilizer usage, and a need for vast swaths of arable land (which could lead to deforestation).

Our Proposed Solutions Include:

- **Supporting entrepreneurs and investors** that can bring advanced biofuel production into commercial production. Two technologies that seem to offer the best hope to address these particular concerns are cellulosic ethanol made from agricultural waste products or from grasses which grow successfully without fertilizers in areas otherwise unsuited to agriculture; and biofuels created from algae, which can be grown in wastewater and typically needs only carbon and sunlight to replicate.
- **Raising awareness** about the issues surrounding biofuels, as well as the benefits of driving flex-fuel vehicles.

Sustainable America has set out an ambitious goal for the reduction of oil usage in the American economy and targets a 50% reduction from today's levels by 2035. Our organization strongly believes in the power of change through action. We aim to help Americans achieve this reduction through both education and the funding of entrepreneurs who seek to solve some of the problems enumerated in this paper. We believe that market-based solutions, when combined with motivated citizens, work best to bring about change, and that together we can make a difference.

[3] National Non-Food Crops Centre of Great Brittain; study by industry body CONCAWE

[4] Presentation by Hart Energy's Terrence Higgins to the EIA, August 2012.