



2016 Top Markets Report **Renewable Fuels**

Overview and Key Findings

Introduction

U.S. export performance – in terms of rising exports and market share – for both fuel ethanol and wood pellets is currently very strong. However, both industries are dependent on foreign markets for future growth, without which these industries may stagnate or decline. In addition to fluctuations in price, trade in these products is correlated with the existence of renewable energy policies that support the use of these renewable fuels.

In the case of ethanol – which is already blended in gasoline in low volumes as an oxygenate – the primary policy driver for larger volumes is usually a national-level blending mandate that increases blend targets over time for the gasoline pool. For wood pellets, renewable energy policies that aim to reduce carbon emissions are encouraging the partial or complete conversion of coal-fired heat and power plants to biomass. This has created demand for wood pellets, which have a higher energy density compared to other biomass feedstocks.

Biodiesel, another liquid biofuel used in transportation, is also traded on the global market. It is blended with fossil diesel to lower greenhouse gas emissions, improve air quality in urban centers, and

increase fuel lubricity thus extending engine life. However, biodiesel will not be covered in the 2015 report because, unlike ethanol, the biodiesel industry is not dependent on foreign markets for short-term growth. It does not face a perceived domestic blend wall, and U.S. diesel use is growing. The biodiesel industry’s strategy is to grow domestic use through annual increases in the RFS2 and maintain tax support through the blender’s credit.

In addition, unlike ethanol, U.S. biodiesel exporters face severe price competition from exporters from Indonesia, Malaysia and Argentina, who enjoy lower feedstock costs. In 2014, there were a limited number of export markets for U.S. biodiesel. Canada accounted for 85 percent of the biodiesel exports; the five largest destinations – Canada, Spain, Peru, Gibraltar and the Dominican Republic – together represented 99 percent of the exports.

This *Top Markets Report* provides analysis on key trends, areas of opportunity and important challenges that exporters need to know in order to compete effectively in foreign markets. It offers projections on the potential for exports in the 2016-2017 time frame as well as eight country case studies with more in-depth information. The 19 countries covered in this report are ranked as shown

Figure 1: Projected Top Markets for Renewable Fuel Exports (2016-2017)

Fuel Ethanol Exports		Biomass Wood Pellets	
1. Canada	7. Philippines	1. United Kingdom	7. Sweden
2. China	8. Netherlands	2. Belgium	8. Japan
3. India	9. Peru	3. France	9. Germany
4. Brazil	10. Jamaica	4. Denmark	10. Italy
5. South Korea	11. United Kingdom	5. Netherlands	11. South Korea
6. Mexico	12. Colombia	6. Canada	

Figure 2: Annual U.S. Ethanol Exports, 2005 - 2015

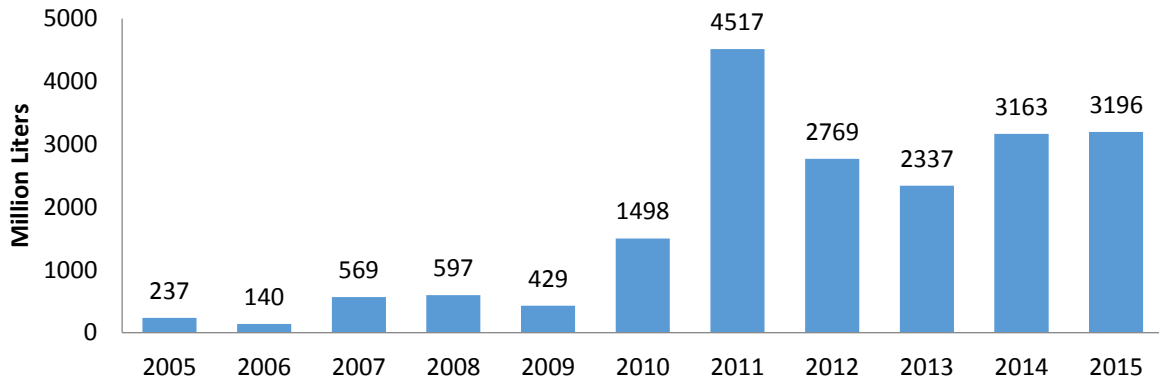
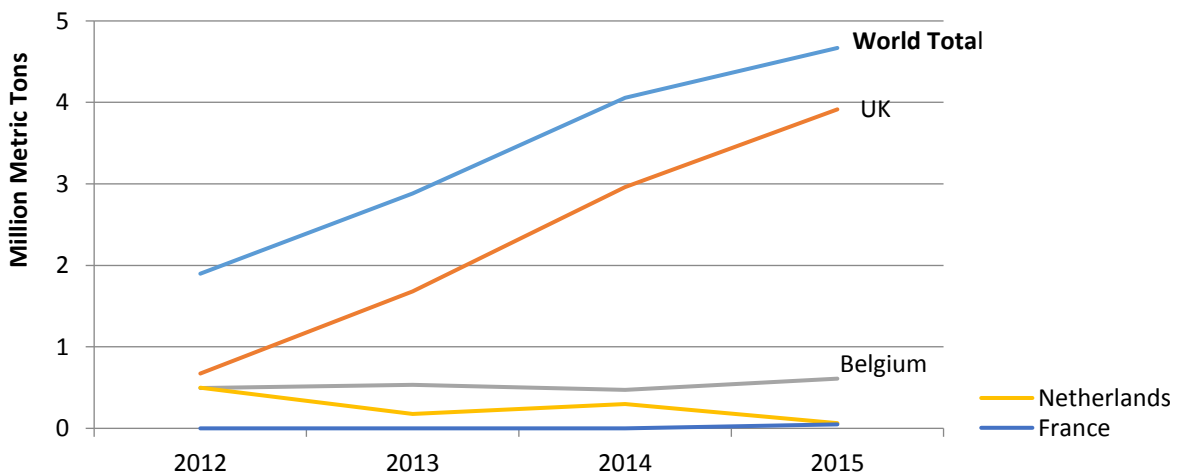


Figure 3: U.S. Pellet Exports to the EU 2012-2015

Vast Majority Shipped to UK



in Figure 1.

The overarching goal of this report is to provide useful context in which to view export opportunities in a changing world, while also offering commentary on how exporters can best leverage the trade policy and export promotion tools offered by the U.S. Government. By providing insight into global markets over the near term, ITA can help exporters compare international opportunities and develop export strategies. Companies should note that ITA’s rankings are based on its current understanding of

the market, which – given the pace of developments in the sector globally and sensitivity to the political environment – can be subject to unexpected changes.

Key Findings: Top Markets and Methodology

Top Markets, 2016-2017

Through the data-driven approach described in more detail below, ITA found several key trends for fuel

ethanol and biomass wood pellets that can suggest future directions for U.S. exporters.

As renewable fuels, both ethanol and biomass wood pellet exports from the United States have increased dramatically over the past five years.

The history of U.S. fuel ethanol exports is shown in Figure 2, with nominal amounts until exports began an upward trend in 2010 with approximately 1.5 billion liters.ⁱ They peaked in 2011 at 4.5 billion liters and have ranged from 2.8 billion liters to 3.2 billion liters in the years since. Although a nationwide drought was largely to blame for the decline in exports in 2012, the industry also was negatively affected in 2013 by the EU's imposition of anti-dumping duties on U.S. ethanol. However, exports rose again in 2014-2015 due to increased demand from the two largest markets (Canada and Brazil) and additional exports to markets in Asia and the Middle East.ⁱⁱ

Meanwhile, wood pellet exports from the United States increased 150 percent since 2012, reaching nearly 5 billion kg in 2015 (See Figure 3). In 2015, the United States far outstripped its closest competitor for exports, Canada, whose exports reached 1.6 billion kg.ⁱⁱⁱ

Trade in wood pellets has been tracked more closely since 2012 by a unique, 6-digit harmonized tariff code, which has indicated the global export market has grown from \$1.7 billion per year to over \$2.4 billion per year.^{iv} The total value of exports dipped in 2015 despite increased quantity, which indicates decreasing unit costs.

The most noticeable pattern in both sectors was the emergence of Asian markets with growing import demand. For fuel ethanol, examples include the Philippines and India. For pellets, both South Korea and Japan have increased their intake of foreign wood pellets in recent years, although the United States is capturing a small share of the import demand in both countries.

Undeniably, some trade partners – such as Canada and the UK – will remain our largest export markets for the foreseeable future. Canada, which in 2015 imported 43 percent of its needs, will likely continue to be the biggest customer of U.S. ethanol, although exports to China surpassed those to Canada in mid-2016. In the long term, the question is whether

emerging policies at Canada's provincial or national levels favoring lower greenhouse gas (GHG) emission fuels might be leveraged to increase imports even more. The UK, which ironed out its sustainability criteria for wood pellets last year, is by far the largest importer of wood pellets in the world (in 2015, the UK's imports reached 6.5 billion kg, which was 93 percent of its consumption). The U.S. industry will continue to be the dominant supplier.

In both cases, U.S. producers have a large share of a large import market. However, there are also markets where the domestic consumption in the country is so large that even supplying a small percentage is a significant opportunity. Brazil, with its 27 percent blend requirement for gasoline and large flex-fuel fleet (giving consumers the ability to use up to 100 percent ethanol in their vehicles), has a high level of production and only needs to import two percent of its domestic consumption. Fortunately, U.S. ethanol exporters have captured the majority of that limited import market, which still accounted for approximately 500 million liters in 2015.

Small market shares in large markets are tenuous at best. For example, Korea initially took in a large volume of wood pellets from the United States in 2013 and 2014. However, U.S. pellets captured only 3 percent of the total import demand in 2014 while Vietnam and China dominated among the foreign suppliers. Starting in 2015, U.S. wood pellet exports to Korea dropped dramatically and there have been none reported in 2016. Meanwhile, Korea reported over 1 billion kg of imports from Vietnam in 2015.

The rankings for each sector are based on the total volumes expected to be shipped to the target markets in 2016 and 2017. However, when taking steps to further promote exports to these countries, the total import demand and the U.S. share of that import demand must be taken into consideration. For this report, ITA selected eight markets – Brazil, Canada, China, India, Mexico, the Philippines, the EU and South Korea – to develop case studies exploring the specific reasons for import demand and the challenges to expanding exports to these countries.

Methodology

The first step in compiling the ITA rankings was to narrow the field to the most promising export markets, based on two key factors for each country:

Figure 4: Countries Ranked in the Renewable Fuels Top Markets Report

	Ethanol	Pellets
Belgium		•
Brazil	•	
Canada	•	•
China	•	
Colombia	•	
Denmark		•
France		•
Germany		•
Italy		•
India	•	
Jamaica	•	
Japan		•
Korea	•	•
Mexico	•	
Netherlands	•	•
Peru	•	
Philippines	•	
Sweden		•
UK	•	•

1) significant U.S. export patterns for 2012-2015; and 2) the existence of supportive policy that maintains or grows domestic use of the renewable liquid fuels for transport (ethanol) and biomass for stationary heat and power. Figure 4 shows a breakdown by sector of the countries that are included in this year’s rankings, meeting both of the above criteria. One exception was made with regards to South Korea. Although initial discussions are taking place among Korean policymakers to gradually phase in a blend mandate, the steadily growing demand for U.S. ethanol seems to be driven by other needs such as industrial chemicals for bioplastics. Since the use in Korea is neither purely discretionary nor opportunistic, it was assumed that U.S. exports to Korea are reliable enough to include in the rankings in 2016-2017.

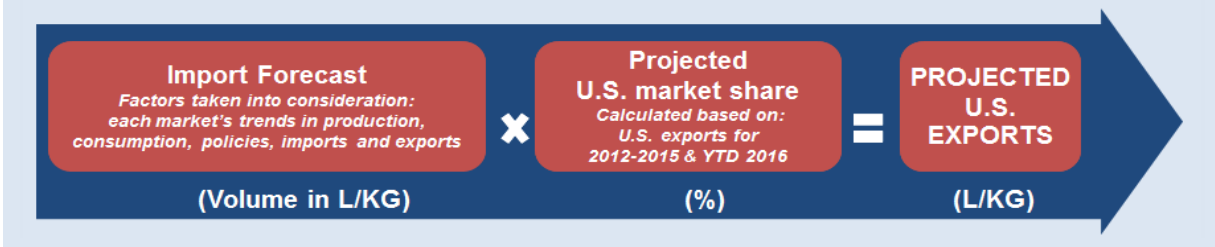
Due to the lack of overlap in the export markets, each sector is ranked separately in this report, rather than combining the results of both sectors into one overall renewable fuels ranking. Ethanol export destinations represented a wide variety of regions, even within the top 20 markets where they are concentrated (although more than 100 countries have imported U.S. fuel ethanol in the past five years). Pellet exports, by contrast, were mostly to Europe.

For ethanol, several mid-level markets that ranked in the top 15 destinations for U.S. sales in 2015 (the UAE, Tunisia and Singapore) are excluded. As explained further in the sector snapshots, some of these “destinations” are regional hubs with no domestic use mandates. In other words, the ethanol was redistributed to other countries, in some cases solely for discretionary use (that is, based only on low cost of ethanol and its use as an oxygenate in gasoline). While the importance of these markets is undisputed when ethanol prices are low relative to gasoline, they do not meet the second criteria to be included in this report.

Ultimately, 12 markets were selected for ethanol and 11 markets selected for wood pellets. The countries near the top of the rankings have strong prospects for U.S. exporters. Those in the middle of the rankings are less easy to predict in the near term but still expected to be favorable to U.S. suppliers. For the countries towards the bottom of the rankings, potential opportunities can only be unlocked through addressing trade barriers. Please refer to the “Sector Snapshots” for ITA’s rankings within these categories.

The rankings were determined using the methodology in Figure 5, based on volume. The unit cost to ship the ethanol or pellets to the export market, while available in trade data, was not part of the formula. While there may be variances in the unit prices, these reflect the logistical costs and therefore have no impact on the bottom line in a practical sense. The rankings for ethanol are determined by the combined number of liters predicted to be exported to the target market in 2016 and 2017 combined. The rankings for biomass wood pellets are determined by number of kilograms predicted to be exported to the target market in 2016 and 2017 combined. The rankings may thus be affected by a large increase or decrease in either year of the timeframe.

Figure 5: Methodology for Renewable Fuels Top Markets



Import Demand: Market Size vs. Market Share

The first variable in the formula, import demand, is a forecast of the market’s expected imports of the ethanol or pellets, regardless of the source. In the simplest case, a country’s domestic production capacity could be falling short of policy goals and imports are welcomed as a solution. This is certainly true for ethanol in Canada, where local production satisfies slightly more than half of the total consumption.

However, in some cases, a country exports the product in addition to using it. In this case, exports could be viewed as a component of the import demand. For example, the Netherlands has a blend mandate, but due to Rotterdam’s role as a fuel port to the rest of mainland Europe, it also exports ethanol. In fact, there is no question that U.S. ethanol is being redistributed. Figure 6 illustrates how in some years, the amount of exports exceeded domestic production in the Netherlands.

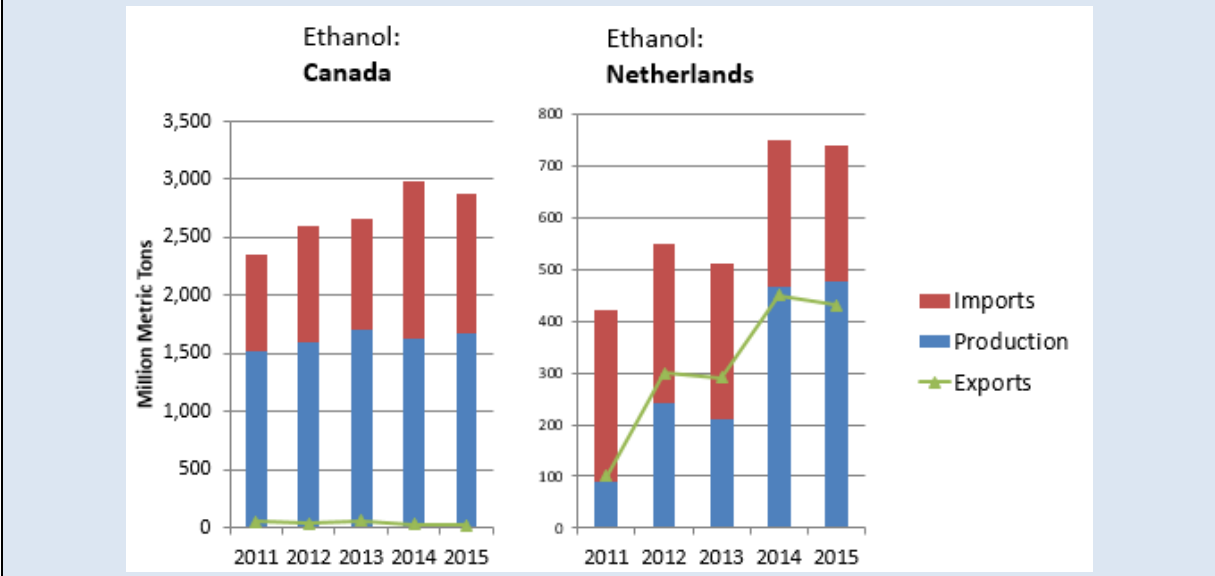
Regardless of whether the imported U.S. ethanol is consumed in the Netherlands or re-exported elsewhere, the import demand can be calculated. However, the Netherlands also imports from other sources. Therefore U.S. trade data for exports to the market contrasted with that market’s total imports will produce a fairly accurate market share.

Estimates of 2016 and 2017 ethanol imports for each country in the *Top Markets Report* were provided by Platts S&P Global. Estimates of 2016 and 2017 wood pellet imports were provided based on directional trends of three years of data from the U.N. Food and Agriculture Organization (FAO), with adjustments made based on known policy impacts as appropriate.

For this report, a “large market” refers to the size of import demand (by volume) rather than consumption. The market share is the percentage of imports rather than percentage of consumption. This comparison is used because the U.S. product, whether ethanol or wood pellets, is essentially competing with imports from other markets. For

Figure 6: Exports of ethanol compared to production and imports

Data Source: Global Trade Atlas



example, Korea imports most of its wood pellets from Vietnam, while Japan imports mostly from Canada. The true challenge for U.S. suppliers is two-fold: will the country increase its consumption and, therefore, increase the opportunities for importers (if domestic production remains the same)? And can the U.S. suppliers capture a larger share of the market as it grows?

A Few Caveats

Every year ITA improves the reports based on feedback from the previous years. However, even with its fourth iteration of analyzing fuel ethanol and biomass wood pellets, ITA cautions that these rankings are based on estimates and forecasts, as well as historical trade data as reported by exporters to U.S. Customs.

Prior to 2012, the U.S. exporters only selected beverage or non-beverage purposes in the Harmonized System (HS) codes for ethanol. The 10-digit codes for “ethanol for fuel use” (denatured and undenatured) have been used since 2012 by the United States as an extension to the 6-digit HS codes 220710 and 220720. These are distinct from the corresponding 10-digit codes for ethanol for non-beverage industrial chemicals. There is a possibility that some U.S. exporters are over-reporting or underreporting their shipments if they do not select the correct code. Another issue is that fuel-grade ethanol may be exported, but it might be used as a non-beverage industrial chemical instead.

As a result of the differences in reporting systems between the United States and other countries, as well as difficulties in accurately identifying end use at the time of export, ITA has discovered some discrepancies between the trade data compiled by the U.S. Census Bureau and the import data reported by other countries. When undenatured ethanol that has been designated by U.S. exporters as “for fuel use” enters a country that does not have a separate system for identifying fuel use, it is impossible to verify whether it is used for its intended purpose without further investigation, which is beyond the resources available for this report. This issue and the countries where it is applicable will be addressed more fully in the Sector Snapshot.

In 2012, the wood pellet HS code was harmonized by the World Customs Organization at 440131 for all

countries, so trade data discrepancy issues are not evident with the wood pellet trade data.

Industry Overview and Competitiveness

The low price of corn ethanol (compared to sugar cane ethanol as well as compared to gasoline) and the increased discretionary blending worldwide are key factors attributed to the dominance of U.S. ethanol in global trade. Although Brazil used to be the leading ethanol exporter in the world, the United States in recent years has surpassed or nearly matched Brazil’s exports. This includes 2015, when crude oil prices reached extreme lows. The price gap between ethanol and gasoline narrowed, but consumption of gasoline rose, resulting in more blending of ethanol.

Domestic production of corn-based ethanol has approached the statutory levels of the Renewable Fuel Standard (RFS). As a result, U.S. producers either must reduce production or export the surplus. In addition, the Low Carbon Fuel Standard (LCFS) in California favors the sugar-cane based ethanol made in Brazil. Brazilian ethanol is being shipped to the West Coast while U.S. ethanol is exported to Brazil to meet the consumer demand for cheaper ethanol. The U.S. Energy Information Administration noted that 44 million gallons entered the United States on the West Coast in 2015, up from 13 million gallons in 2014.^v Otherwise, conventional ethanol production is sufficient to meet domestic demand.

According to *Biomass Magazine*, in 2016 there were 184 pellet plants in the United States with an annual production capacity of 18.6 trillion tons per year combined.^{vi} The U.S. Energy Information Administration (EIA) predicts that electric power generation from wood and other biomass is expected to increase from 15.1 billion kWh in 2014 to 17.7 billion kWh in 2040, an annual growth rate of 4.3 percent.^{vii} The majority of the increase is expected to come from dedicated plants, but co-firing is predicted to decrease.

Some studies have also shown that the increased production of woody biomass in the United States has an economic benefit without devastating forests. The USDA notes that “forest owners will more effectively and intensively manage forests to increase their value and optimize biomass production and use over time.”^{viii}

While opportunities can be found in most markets, the destination of U.S. renewable fuel exports will continue to be highly concentrated. The top 10 destinations for U.S. fuel ethanol combined constitute 90 percent of all the exports, while 85 percent of all U.S. wood pellet exports go to the UK.

Global Industry Landscape

The global demand for bioenergy is generally driven by the need for heat sources, but the growth in this sector is attributed to policies that incentivize cleaner emissions for electric power and cleaner-burning fuels for transportation. In 2015, the world generated 464 terawatt hours of electricity from biopower, which is mainly produced from solid biomass compared to other sources such as municipal solid waste or biogas.^{ix} The EU accounted for approximately one-fourth of that total.^x As for global ethanol production, the United States and Brazil together accounted for 86 percent in 2015. The next largest producers were China, Canada and Thailand.^{xi}

Challenges and Barriers

Despite the enormous success that U.S. ethanol and wood pellet exporters have experienced in recent years, many issues have emerged as obstacles to continued U.S. export growth.

Absence of blend mandate (Ethanol): The existence of a policy environment that requires petroleum companies to blend gasoline with ethanol is usually a prerequisite to U.S. ethanol exports. In the case of the regional hubs (UAE, Singapore, etc.) without blend mandates, the low cost ethanol is driving demand for discretionary blending. Ethanol is recognized as an octane booster; if the price is right, a company will voluntarily blend higher amounts with gasoline for better engine performance and lower the overall cost of the finished product. Larger amounts are needed to obtain significant environmental benefits. For a list of blend mandates in each of the 12 markets covered in this report, see Appendix.

Absence of co-firing incentives (Wood Pellets): Similarly, without government incentives for the substitution of wood pellets for coal, oil or gas in the heat and power sectors for environmental purposes, there is no export market for wood pellets. These incentives are usually based on policy goals for

higher renewable energy content or carbon reduction. Countries wishing to fulfill these policies, but lacking the natural resources or production facilities to manufacture pellets, are more likely to import them. However, when these incentives are tied to sustainability criteria or local production requirements, U.S. and other foreign suppliers may be negatively affected. This is discussed in further detail below.

Sustainability criteria (Ethanol/Wood Pellets): Both grain-based ethanol and wood pellets face criticism from environmental NGOs and several in the academic community, despite their potential to reduce GHG emissions compared to fossil fuels as well as their ability to reduce air pollution. For instance, concerns have been raised that corn ethanol's GHG reductions are offset by the environmental impact of growing the crops for the feedstock. Based on life cycle analysis, waste-based fuels achieve generally higher reductions of GHG emissions than traditional grain-based ethanol.

For this reason, cellulosic ethanol, using waste residues from forest and agricultural industries, is given preference to satisfy environmental goals with the least amount of controversy both at home and abroad. However, due to higher production costs, cellulosic ethanol lags behind corn ethanol in terms of its commercial profitability. For pellets, the issue has been how to provide concrete evidence of sustainable forestry practices.

As detailed in the country case study, EU member states are developing sustainability certification regulations in a patchwork manner. Since the U.S. agricultural and forestry systems are structured differently than the EU, concerns have been raised as to whether such regulations will cut off trade in wood pellets completely. South Korea is also developing sustainability criteria, for which the impact is yet to be fully understood.^{xii}

Preference for local production (Ethanol/Wood Pellets): Many countries, such as India, the Philippines, China, and Mexico, state openly in their policies that locally produced ethanol is given a preference over imports. This is generally not an issue for pellets, because most countries that recognize their limitations with natural resources or production capacity tend to foster a relatively more open import regime.

Knowing the key players (Ethanol/Wood Pellets): U.S. ethanol producers now feel the constraint of how much ethanol can be absorbed in the U.S. market for fuel. At the same time, small and midsize U.S. ethanol producers are now finding their stock is in demand in countries where they have not met the buyers directly. Normally such producers rely on third party distributors to arrange trade logistics. From a long term strategic viewpoint, however, market intelligence and business relationships will build a steady trade flow. U.S. ethanol fuel associations are beginning to focus their efforts on assessing overseas demand potential, including a better understanding of the political context in various markets. The same is true for the pellet industry, which is working with U.S. Embassies in Japan and Germany to reach more customers through educational sessions that highlight sustainable forestry practices in the United States.

Antidumping tariffs in the EU (Ethanol): In February 2013, the EC imposed antidumping duties broadly against U.S.-produced ethanol, leading to a sharp decrease in exports to EU Member States that year. Prior to 2013, the EU accounted for nearly one-third of the U.S. ethanol exports. However, that number has fallen to around 5 percent. The loss of market share resulting from the antidumping duties was particularly evident in the UK, which still imports over half of its ethanol needs; the U.S. share of that import market went from 58 percent in 2012 to less than 1 percent in 2014.

The antidumping duties were challenged in EU court by U.S. ethanol industry associations, who ultimately won their case in 2016. However, since the EC appealed the decision, the antidumping duties will remain in place for the near future and exports to

the EU will continue to be severely limited during the 2016-2017 timeframe.

Opportunities

In 2016-2017 and beyond, both industries will continue to grow their market share or expand to new markets, while facing the challenges and barriers outlined earlier.

Although the nature of commodity trading tends to be subject to outside forces such as exchange rates and weather conditions, renewable fuels have one advantage: countries around the world are relying on them to address GHG emissions. While the exact GHG reduction attributed to either fuel ethanol or biomass wood pellets is under rigorous debate, governments recognize that to a certain extent fossil fuel substitution is necessary. Therefore close monitoring of the policy developments in all markets is a key strategy for exporters. U.S. Government resources such as this report as well as the annual GAIN reports on select markets by the U.S. Department of Agriculture (which can be downloaded online – see Addendum), are a valuable starting point.

Overseas trade missions also foster expansion of business opportunities, whether focused on exchanging views and best practices with the foreign government policymakers to lay a stronger foundation, or whether designed solely for business-to-business matchmaking to enhance commercial relations. In addition, ITA's International Buyer Program can be utilized by trade show organizers to bring foreign delegations to U.S. based conferences and expos (see Addendum for more information).

ⁱ Ethanol export data prior to 2012 includes small amounts of industrial (non-fuel) ethanol.

ⁱⁱ US Census data

ⁱⁱⁱ Global Trade Information Services. (2015). *Global Trade Atlas*.

^{iv} Global Trade Information Services. (2015). *Global Trade Atlas*.

^v Energy Information Administration. (2016). U.S. ethanol exports exceed 800 million gallons for the second year in a row. *Today in Energy*.

^{vi} Access from <http://biomassmagazine.com/plants/listplants/pellet/US/>

^{vii} Energy Information Administration. (2016). *Annual Energy Outlook 2016*.

^{viii} Johansson, Robert. (2015). Study finds increasing wood pellet demand boosts forest growth, reduces greenhouse gas emissions, creates jobs. Retrieved from <http://blogs.usda.gov/2015/06/08/study-finds-increasing-wood-pellet-demand-boosts-forest-growth-reduces-greenhouse-gas-emissions-creates-jobs/>. Johansson is the USDA Acting Chief Economist.

^{ix} Renewable Energy Policy Network for the 21st Century. (2016). *Renewables 2016 Global Status Report*, page 45.

^x Ibid.

^{xi} Ibid, page 46.

^{xii} Fletcher, Katie. (2015). Situation South Korea. *Biomass Magazine*. Retrieved from <http://biomassmagazine.com/articles/12543/situation-south-korea>.