
U.S. ETHANOL
TRENDS & OUTLOOK
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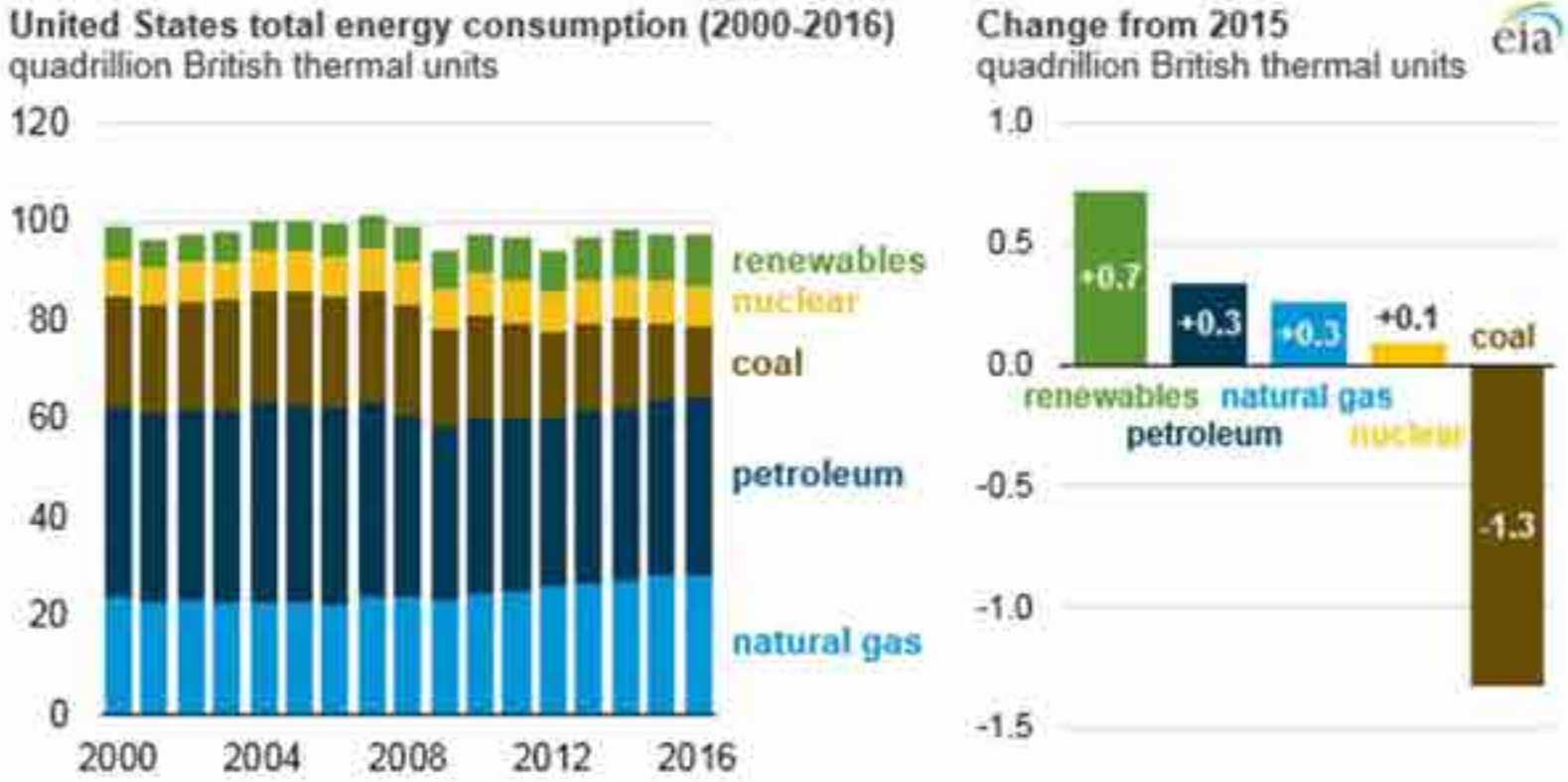
U.S. energy use – renewables share increasing



Source: U.S. Energy Information Administration

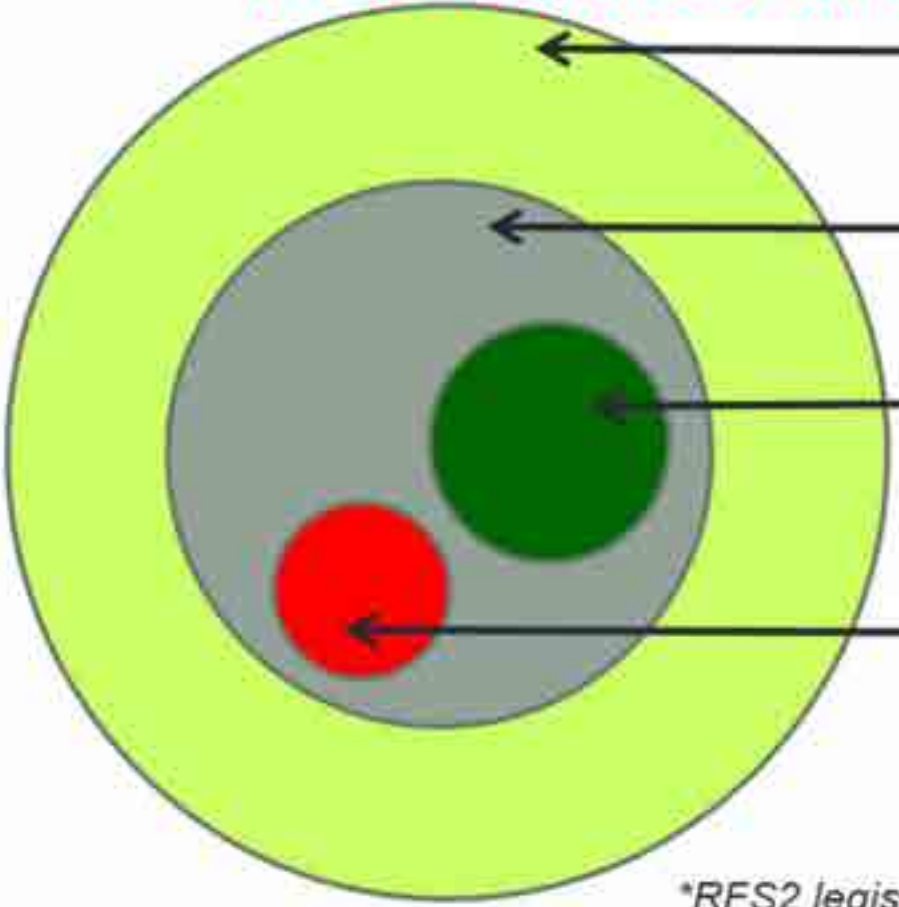
Energy Independence and Security Act of 2007 established the Renewable Fuel Standard (RFS2)

- Changed definition of renewable fuels to include minimum lifecycle greenhouse gas (GHG) reduction thresholds and grandfathered volume from certain facilities

- Fuel categories must meet greenhouse gas lifecycle reduction thresholds
  - 20% – Conventional Biofuels (ethanol derived from corn starch from new facilities)
  - 50% – Advanced Biofuels
  - 50% – Biomass-based Diesel
  - 60% – Cellulosic Biofuels

- Restricted types of feedstocks that can be used to make renewable fuel and the types of land that can be used to grow and harvest feedstocks

RFS2 consists of 4 nested standards



Renewable fuel (36 bgal*)
- Corn ethanol

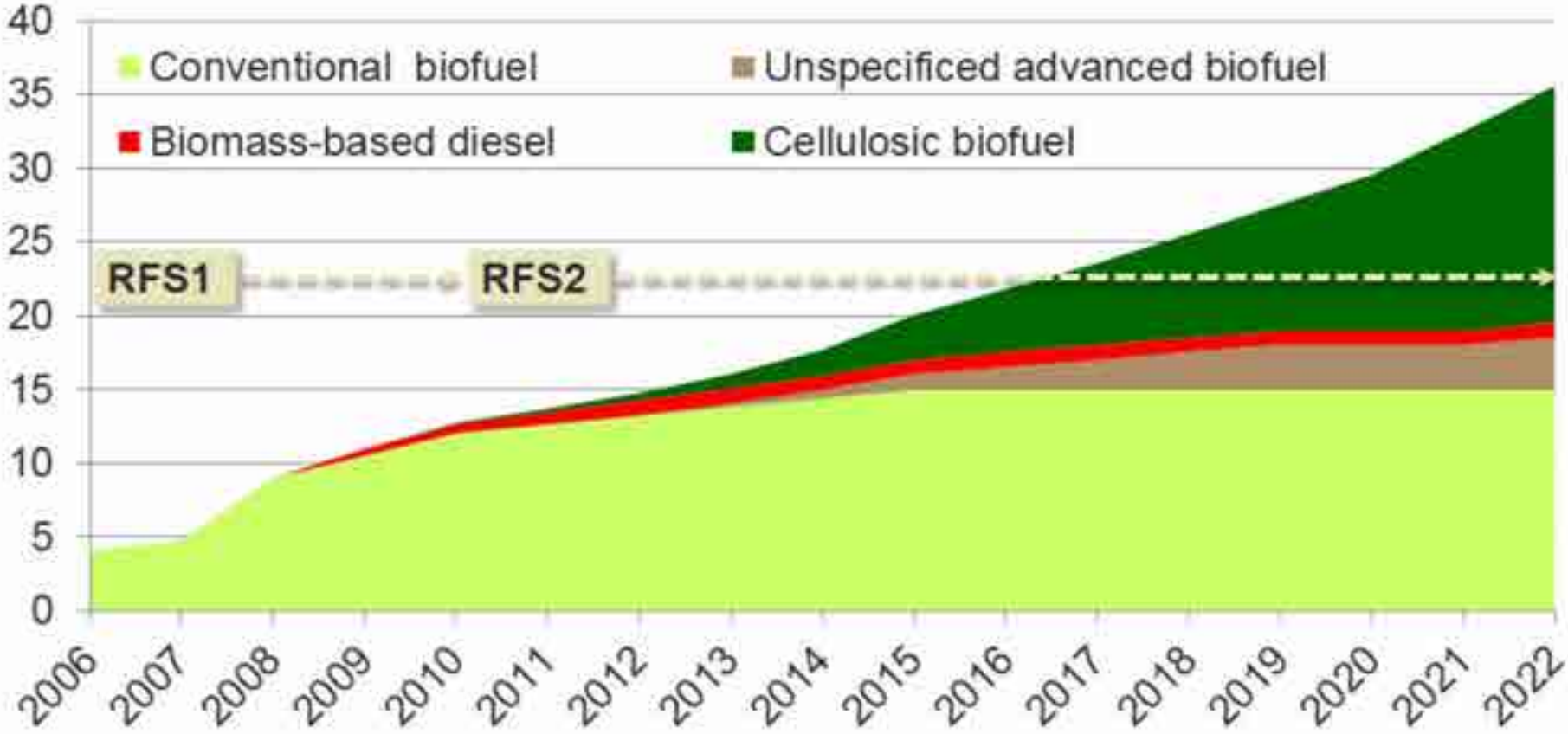
Advanced biofuel (21 bgal*)
- Sugarcane ethanol

Cellulosic biofuel (15 bgal*)
- Cellulosic ethanol
- Renewable natural gas

Biomass-based diesel (>1 bgal*)
- Biodiesel
- Renewable diesel
- Renewable jet fuel

*RFS2 legislated volumes for 2022

The legislated version of RFS2 increases over time

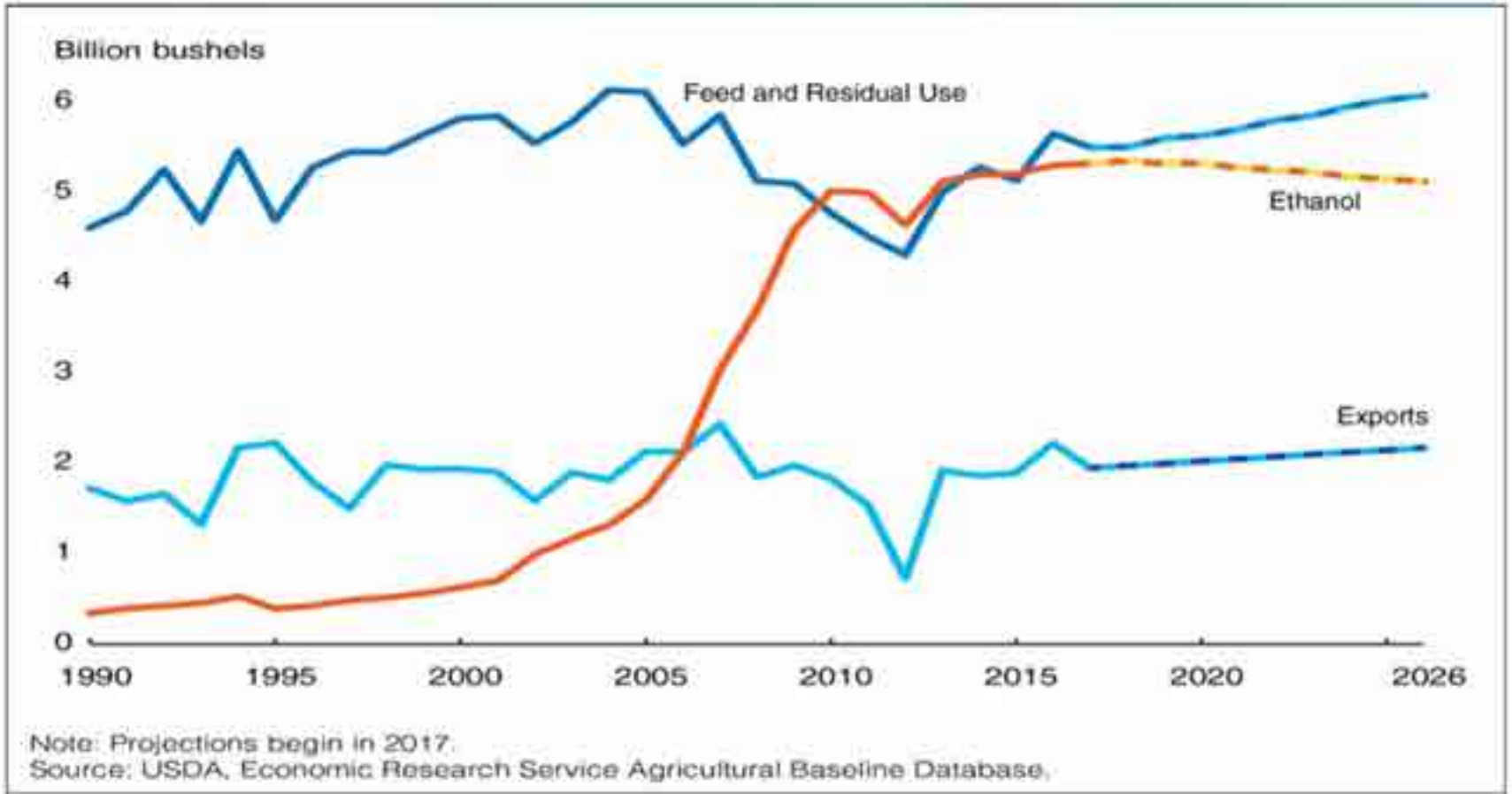


EPA has reduced mandates, when fuels were not available or marketable

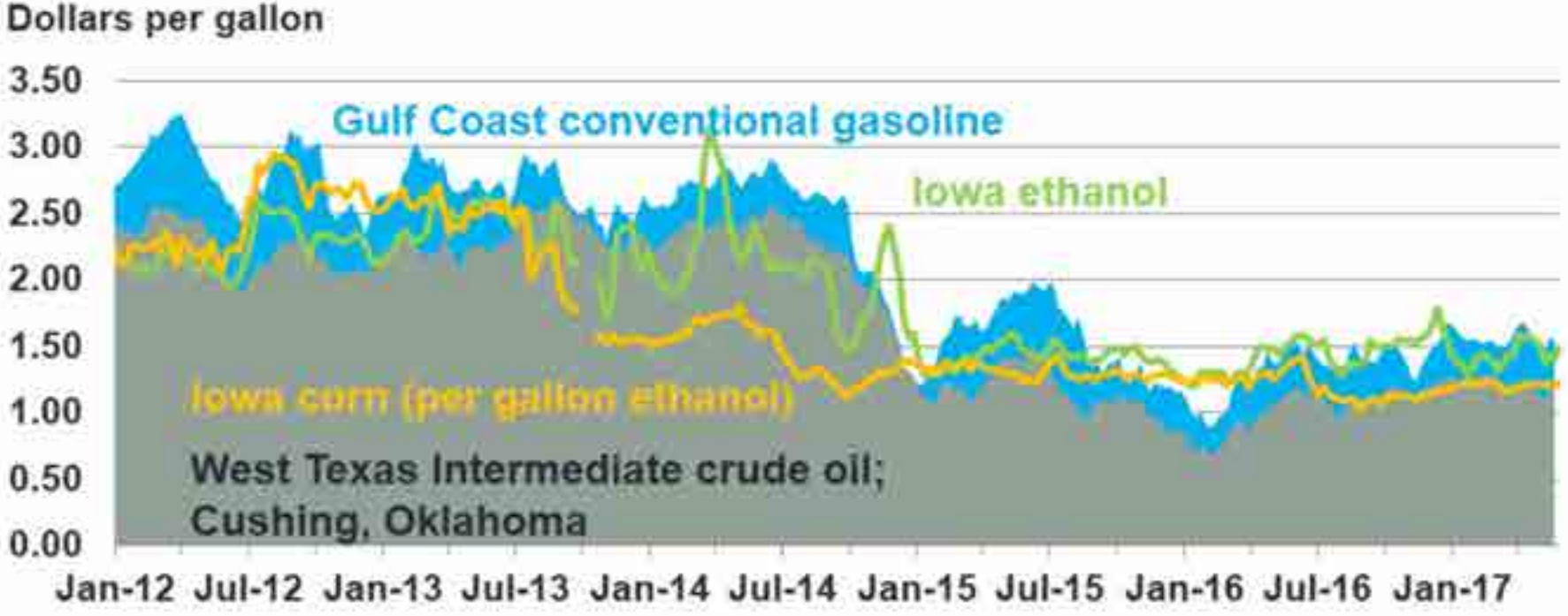
Billion ethanol gallon equivalents	2014		2015		2016		2017	
	Legislated volume	*Implemented volume*						
Cellulosic biofuel	1.75	.033	3	.123	4.25	.23	5.5	.311
Biomass-based diesel	>1	1.63	>1	1.73	>1	1.9	>1	2
Advanced biofuel	3.75	2.67	5.5	2.88	7.25	3.61	9	4.28
Renewable fuel	18.15	16.28	20.5	16.93	22.25	18.11	24	19.28

Source: U.S. Environmental Protection Agency

U.S. projected corn use by type through 2016

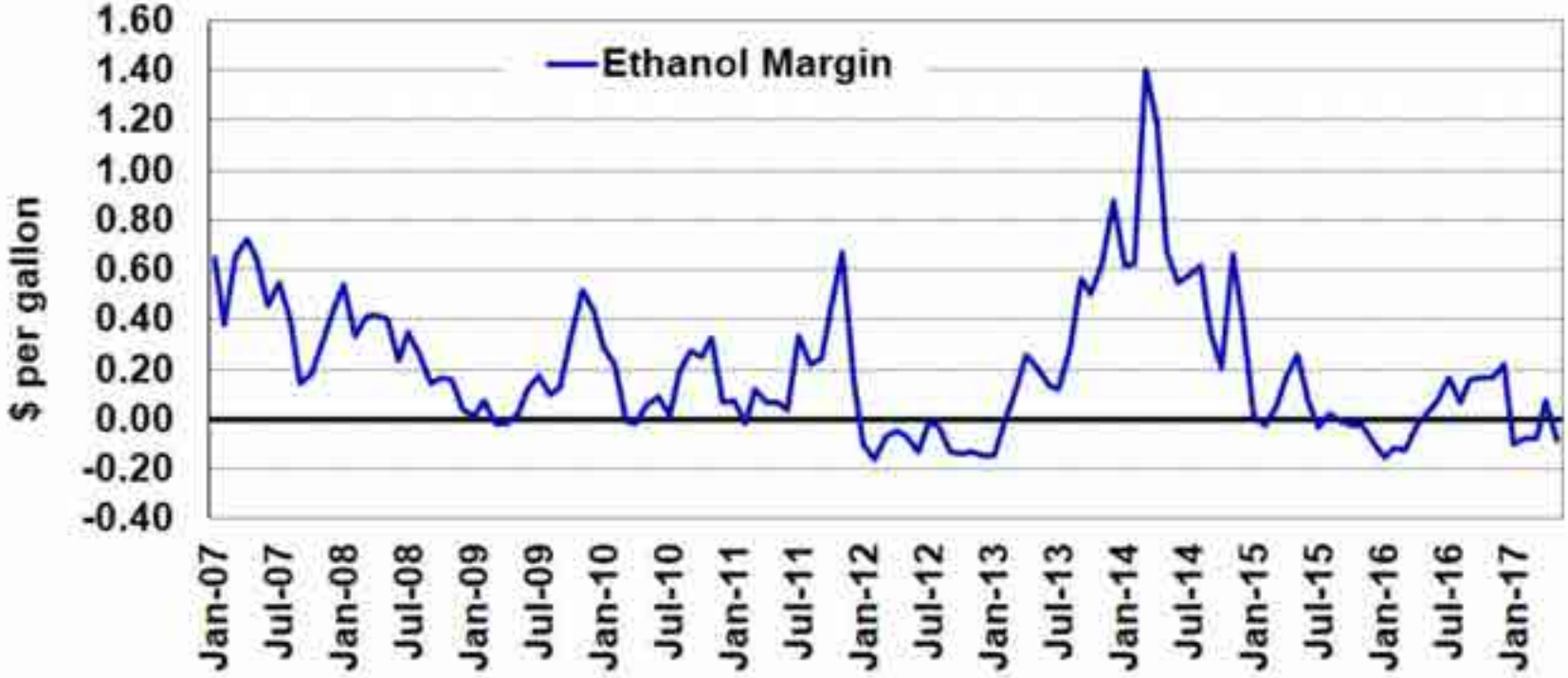


The profitability of ethanol varies with crude oil, corn, gasoline, and ethanol spot prices



Sources: USDA, Agriculture Marketing Service and Thomson Reuters as republished by EIA

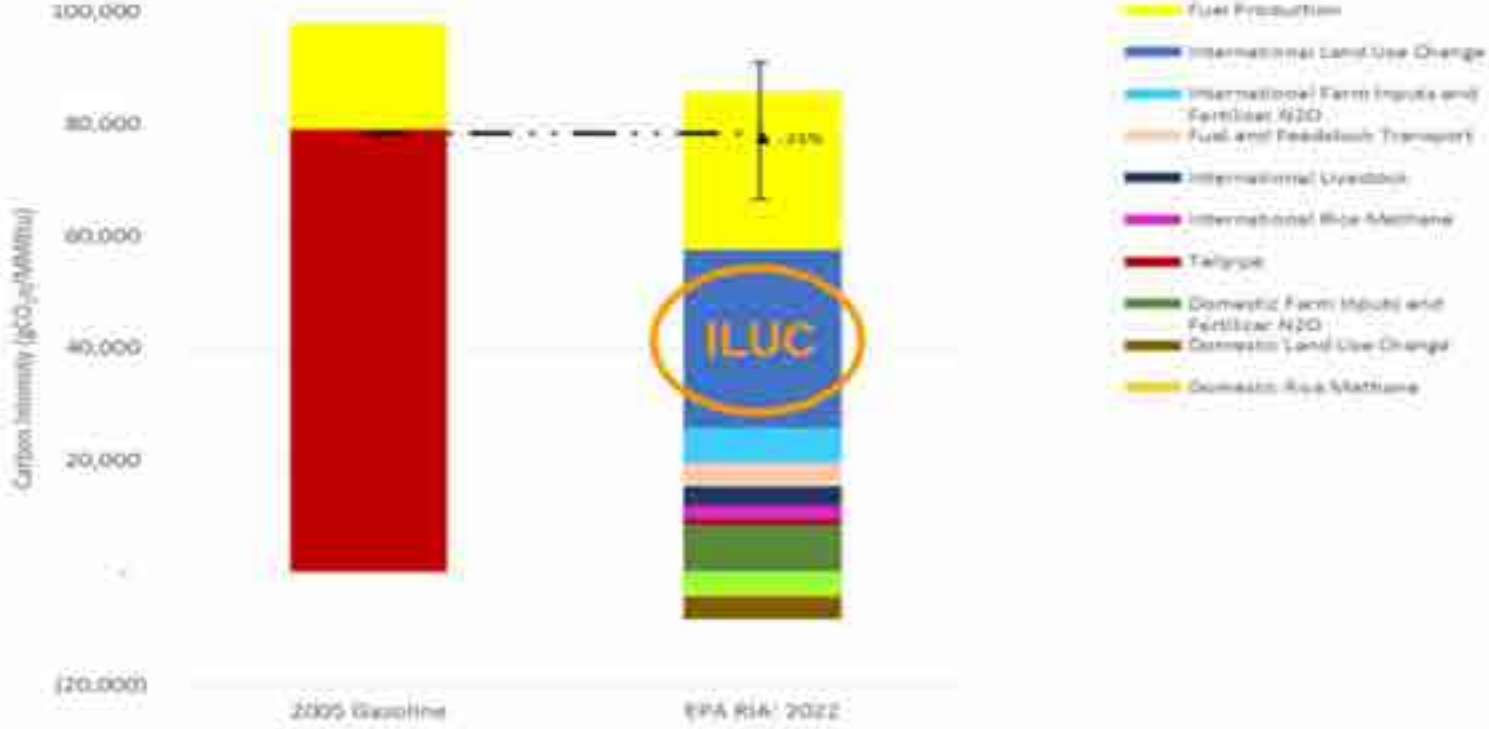
Midwest ethanol production margins tighten since 2014



Source: Iowa State University calculations based on USDA AMS Iowa Ethanol Report & EIA

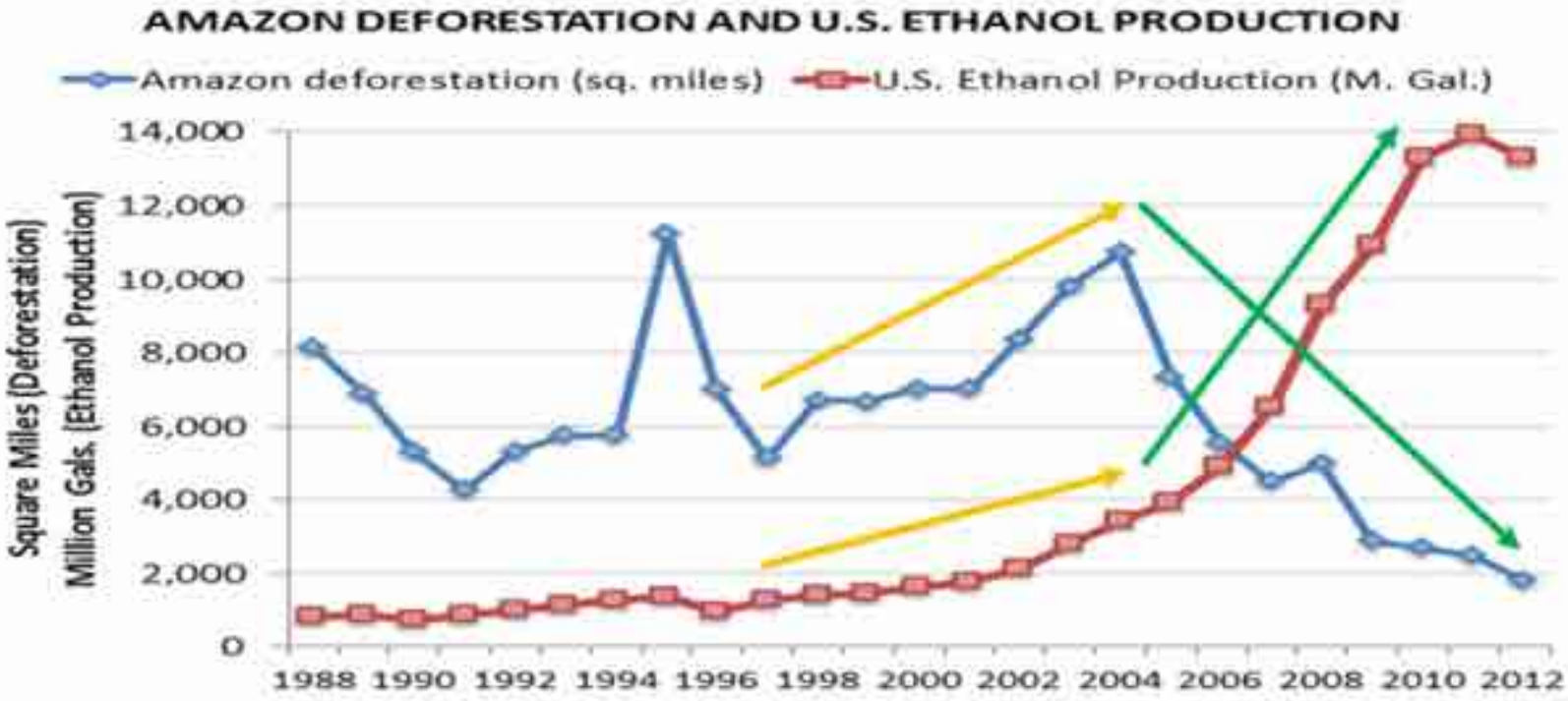
Assessing the Carbon Footprint of Corn-Based Ethanol

EPA 2010 RFS2 regulatory impact analysis lifecycle emissions – gasoline baseline versus corn ethanol



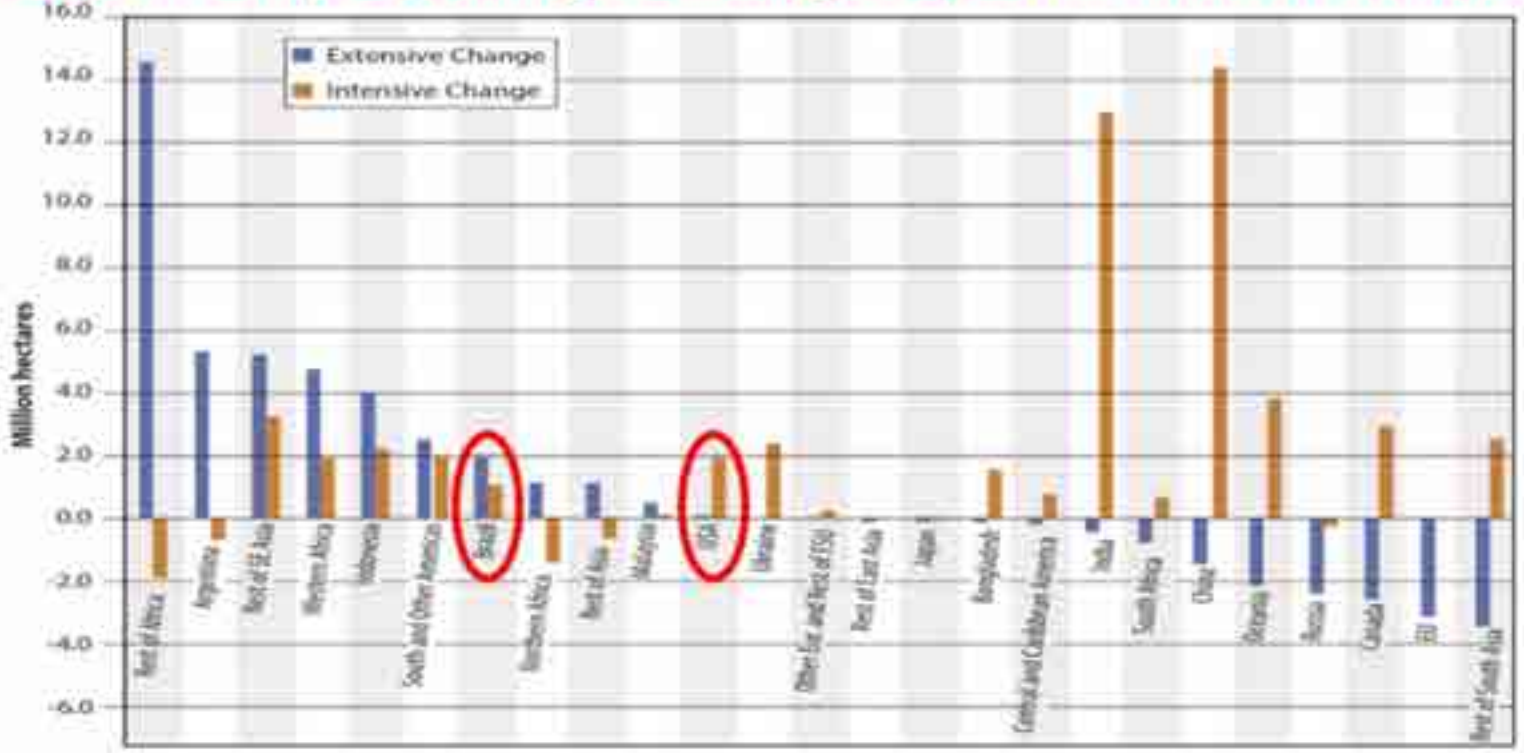
Source: EPA 2010

More recent data dispel link between Amazon deforestation and U.S. ethanol production



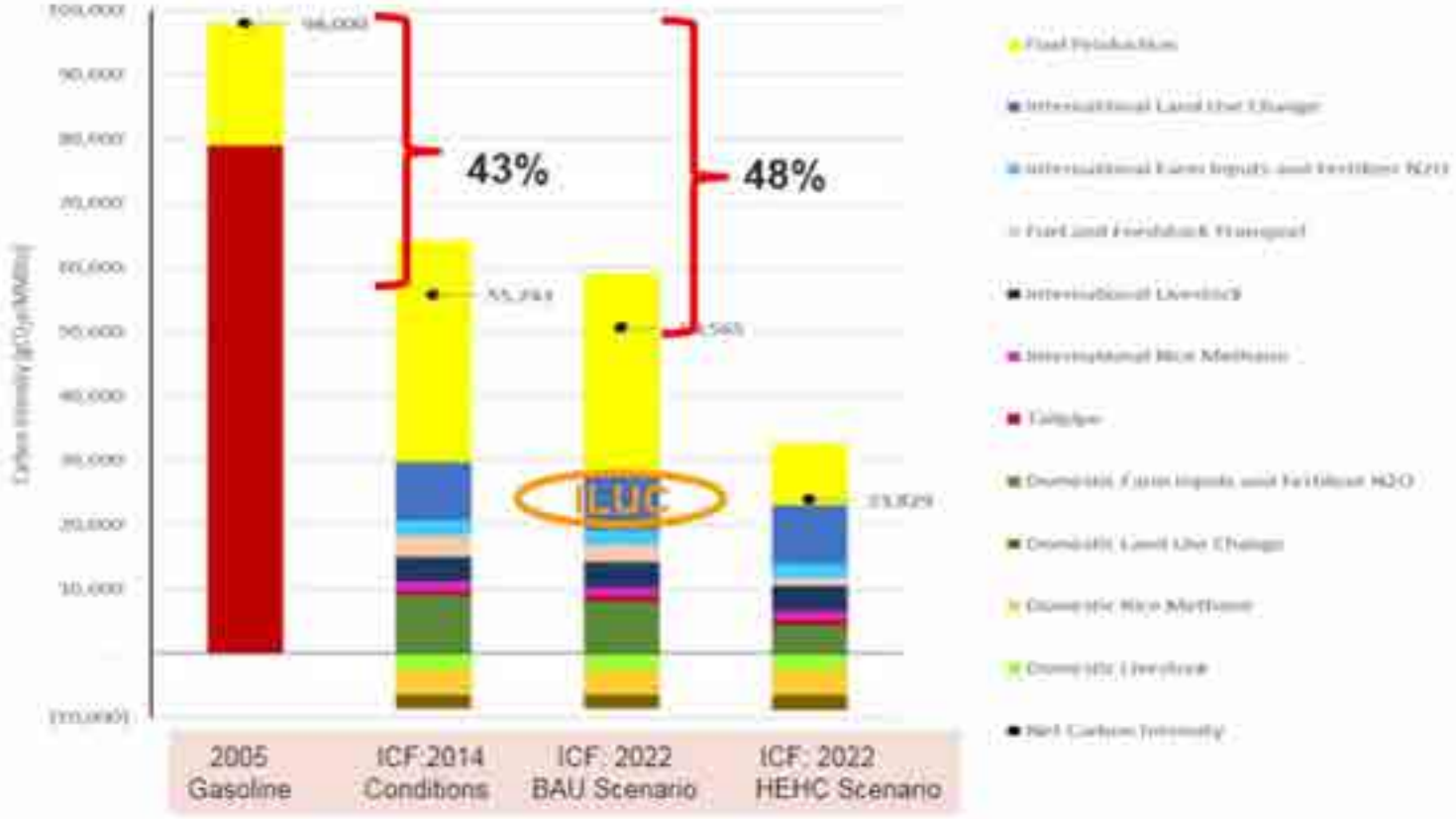
Sources: Brazilian National Institute of Space Research 2014, EIA 2015

From 2004 to 2012, world's farmers responded to higher prices primarily by using existing cropland more intensively

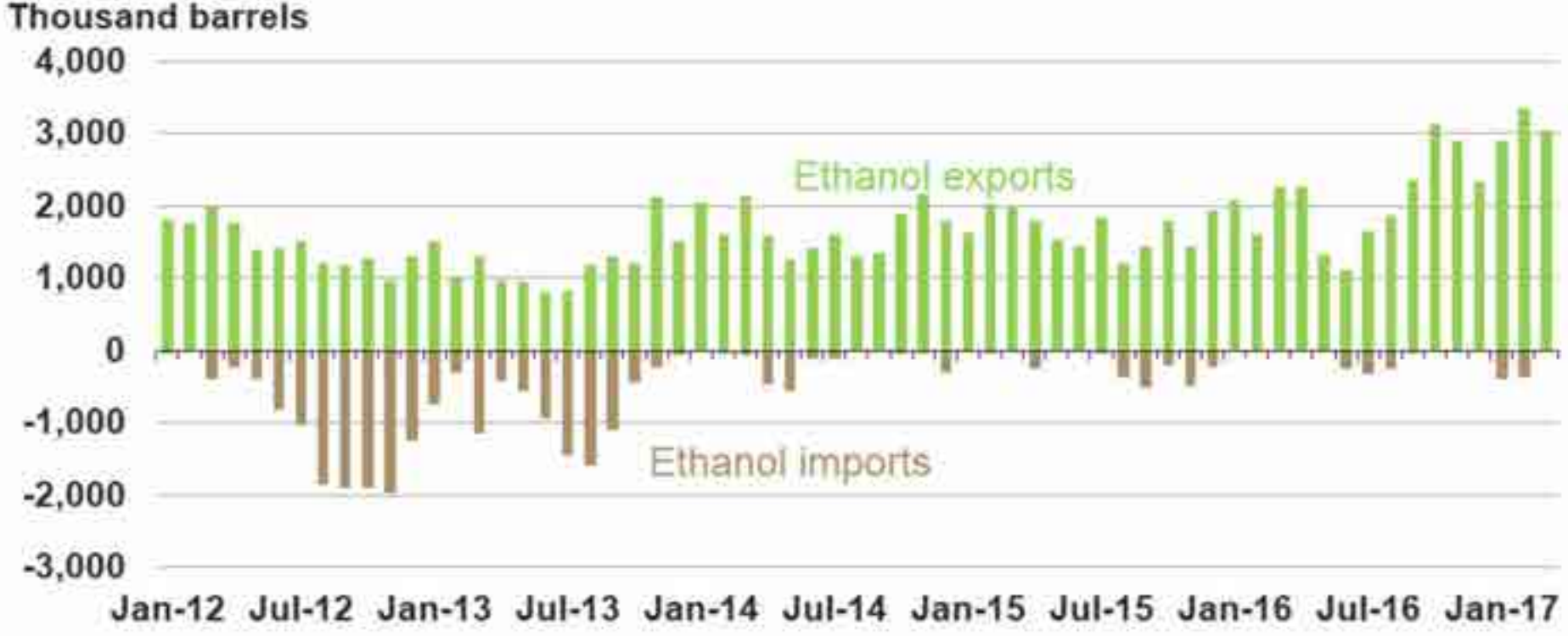


Source: Babcock and Iqbal 2014

Comparison of ICF Scenario Carbon Intensities

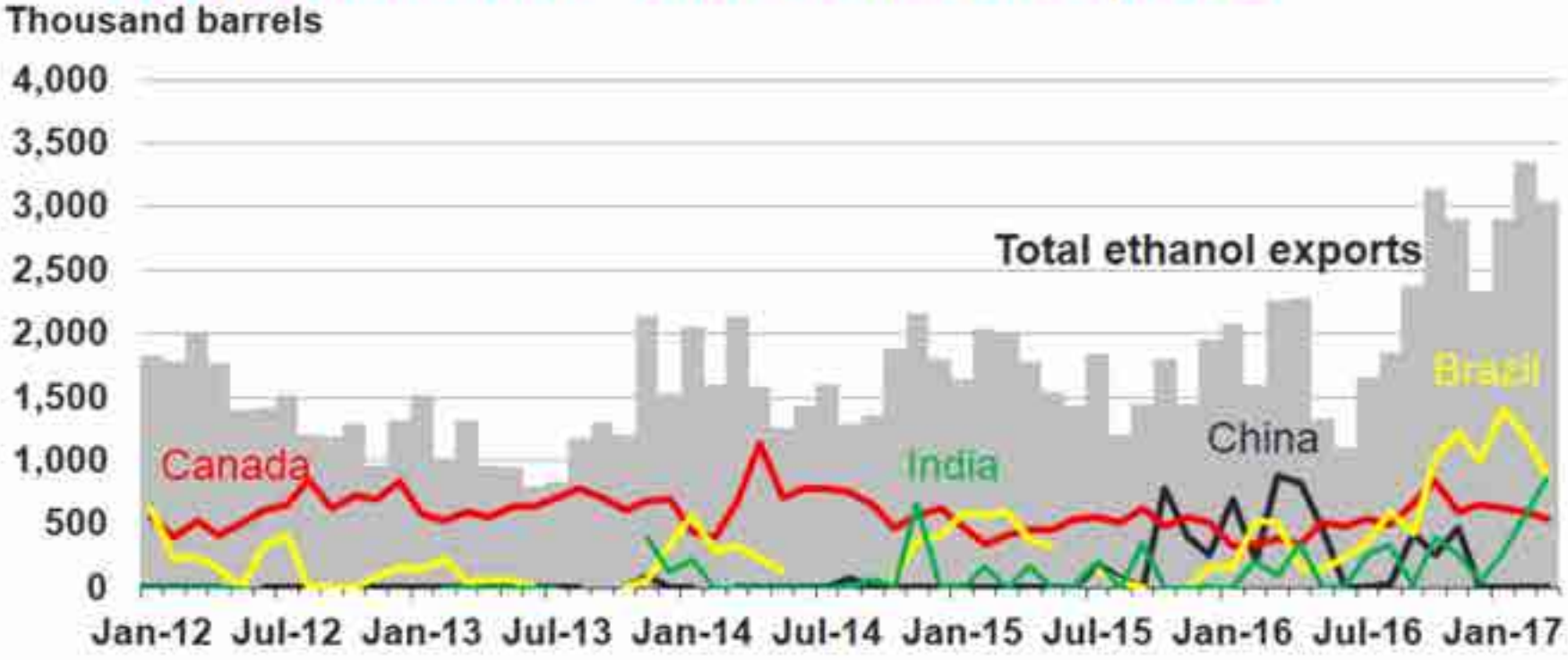


U.S. exports of ethanol reached their 3rd-highest recorded total in February 2017



Source: Energy Information Administration

Brazil, India, and Canada have been the top 3 destinations for U.S. ethanol exports



Source: EIA

Concluding thoughts…

- Technological advancements continue to improve greenhouse gas profile of corn-based ethanol
- Recent studies suggest international land use change much smaller than initially estimated in setting RFS2
- Land use data support reinforce findings of recent studies
- Ample supplies of feedstocks dispel food versus fuel debate
- Ample trade opportunities for expanded use of ethanol globally

Obrigado!

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http://www.usda.gov/oce/commodity/wasde/Secretary_Briefing.pdf