The Impact of Applying RINS to U.S. Ethanol Exports on Farm Revenue and the Economy

Prepared For: Growth Energy

October 2017

Table of Contents

List of Exhibits

Disclaimer

Acronyms

DCO	**Distiller's Corn Oil**
DDGS	**Dried Distiller's Grains with Solubles**
DGS	**Distiller's Grains**
GDP	**Gross Domestic Product**
USDA	**United States Department of Agriculture**

I. EXECUTIVE SUMMARY

The Environmental Protection Agency (EPA) is looking at potentially making a significant change to its biofuel policy which could adversely impact ethanol producers and corn farmers. The EPA is considering a proposal to apply renewable identification numbers, or RINs, to U.S. ethanol exports. This potential policy change would allow about one billion gallons or more of biofuel exported each year to qualify toward US biofuel production mandates. Attaching RINS to exports could be considered an export subsidy and cause a backlash from importing countries imposing countervailing duties on ethanol imports from the U.S. This could potentially wipe out U.S. ethanol export markets and impact U.S. corn producers through lower corn prices. Both corn producers and the ethanol sector could be adversely impacted.

Impacts regarding corn producers

The study finds that corn farmers would be significantly impacted by the above change in policy if U.S. ethanol exports were reduced to zero. Corn losses could be equivalent to $27.9 billion over the four corn marketing years examined starting from 2017/18.

- This assumes that the reduction in fuel ethanol exports would cause a one-to-one reduction in fuel ethanol production, which will result in less corn used for ethanol.
  - The reduced demand for corn for ethanol will be partially offset by higher corn feed use and higher corn exports due to the reduced availability of DDGs and resulting lower corn prices with the remaining portion contributing to higher corn stock.

- Higher corn stocks would result in lower corn prices, 56 cents per bushel lower in the first year.

- Lower corn prices would result in reduced plantings the following year, also reducing somewhat the impact of lower ethanol exports.

- As a result of the above, farm revenue for corn production would decrease sharply.

Impacts regarding the ethanol sector

The study finds that if ethanol exports were reduced to zero, the significant support that these exports lend to the U.S. economy would be threatened. In 2016 ethanol exports contributed to nearly 25,500 full time equivalent (FTE) jobs, over $2.6 billion in GDP, and over $8 billion in total business sales to the total U.S. economy.

- A key assumption in this analysis is that ethanol exports are reduced to zero as a result of trade retaliation and that the volume of ethanol that was exported is reduced from production as well.

- In 2016, the U.S. ethanol industry exported nearly 1.2 billion gallons of ethanol, totaling over $1.7 billion in sales received by ethanol producers.

- Ethanol manufacturers consumed over 411 million bushels of corn, purchasing$1.5 billion worth of corn from U.S. farmers during a time of low commodity prices and increasing downward pressure on net farm income.

II. BACKGROUND

The EPA is looking at making a significant change to its biofuel policy which could adversely impact ethanol producers and farmers. The EPA is considering a proposal to apply renewable identification numbers, or RINs, to U.S. ethanol exports. This potential policy change would allow about one billion gallons or more of biofuel exported each year to qualify toward US biofuel production mandates.

Under current regulations, each gallon of ethanol produced in the US generates a tradable RIN that can be used to prove compliance with annual biofuel mandates. But a RIN currently must be withdrawn if that gallon of ethanol is exported. Because imported ethanol is blended into the fuel supply, credits associated with the use of those foreign supplies qualify for compliance. Allowing the gallons exported to receive RINS effectively would reduce ethanol production next year and dampen demand for higher ethanol-gasoline blends that have helped companies comply with the rules. Attaching RINS to exports could be considered an export subsidy and cause a backlash from importing countries imposing countervailing duties on ethanol imports from the U.S. This could potentially wipe out U.S. export markets and impact U.S. corn producers through lower corn prices.

The objectives of this study are to estimate:

- Farm revenue reductions if ethanol exports were reduced to zero.

- Economic losses (in terms of jobs, GDP and output) to the ethanol sector that would result if U.S. ethanol exports were reduced to zero because of trade retaliation from importers.

III. METHODOLOGY

A. Calculation of Farm Revenue Losses

In order to project the change in farmer revenues given countervailing duties that eliminate the demand for imports of ethanol from the US, Informa utilized a balance sheet approach to approximate the potential increase in US corn stocks given an assumed reduction in ethanol production.

- Informa assumed exports will be completely eliminated by the amount forecast for the years 2018, 2019, 2020 and 2021. Cumulative losses were measured for four corn marketing years since countervailing duties are normally multi-year. Additionally, it was assumed that production would be reduced by the amount of exports lost due to retaliation.

- The reduced export demand results in reduced ethanol production and thus reduced demand for corn to make ethanol. Informa will factor in the reduced demand for corn in its baseline long-term supply and demand balance sheets.

- The other demand factors of feed use and exports were evaluated to determine any potential offsetting factor for the reduction in corn demand for ethanol.

- Corn feed use was increased given a reduction in DDG production, price elasticities were also considered.

- The corn balance sheet shows a new carryout and stocks-to-use estimate which takes into account the net change in corn demand.

- US corn prices are projected given the new balance sheet, the changes in corn price from the baseline assumption are then multiplied by production to give a change in revenue forecast.

B. Calculation of Economic Losses

To estimate the "ripple effects" that ethanol exports have on the U.S. economy, IMPLAN economic input-output software was used. IMPLAN models use historical data and are a fixed pricing model for 536 pre-defined sectors within the economy. However, industries can be customized for sectors that are not well defined within the standard model. Informa used this customized approach to estimate the contribution for the ethanol sector which is not clearly defined as one of the standard 536 sectors. Results from the model provide insight into the number of annual average jobs, Gross Domestic Product (GDP),

and output (industry sales) created via three different impacts. The different impacts estimated by IMPLAN are: direct, indirect, and induced. Each impact is defined below:

- <u>Direct impacts</u> reflect the economic activity that occurs in the industries in which investments are made or changes occur. In the current case, the direct impacts are those that occur at the ethanol plant. For example, if a plant produces $1 million in ethanol production, the direct impact to the region is $1 million in added economic output or sales (that would not have been realized if ethanol production did not occur).

- <u>Indirect impacts</u> are the additional economic impacts that occur to industries upstream of the industry that was directly impacted, as the directly impacted industry purchases inputs and services in order to produce its own commodity or product. For example, increased ethanol production creates indirect impacts on the corn farming industry.

- <u>Induced impacts</u> are those impacts created by changes in the spending of labor income and profits generated by the direct and indirect impacts. In the case of ethanol, wages for the jobs directly supported by ethanol production are spent on housing, medical treatments, groceries, etc. The spending in these industries creates induced impacts for the housing, medical, and grocery store industries, along with other such industries.

A key assumption in this analysis is that all exports of ethanol are reduced to zero because of retaliation from importers as a result of the change in biofuel policy, and subsequently this impact is passed through as a one-to-one reduction in production. Under this scenario Informa can assume that all direct impacts contributed by ethanol exports will be lost and the indirect and induced impacts will be endangered.

Prior to conducting this analysis, a significant amount of data was gathered and analyzed:

- Informa maintains and updates an ethanol facility list with plant type, location, capacity, and idle status. This information in conjunction with USDA and EIA data was utilized in developing the national ethanol production volumes.

- Informa maintains and updates a financial model for a typical ethanol plant. In order to develop industry spending patterns for ethanol as an industry within the IMPLAN models, this was used. Values were consistent with information available in literature, such as the publicly available Iowa State ethanol plant model.

- USDA's "Grain Crushings and Co-Products Production" annual report shows coproduct production as well as corn used in fuel ethanol production.

- IMPLAN models require value of production as opposed to volume of production. In order to develop these measures, price information was gathered from USDA's AMS and NASS, as well as proprietary data sets developed and maintained by Informa on an ongoing basis.

IV. FARM REVENUE IMPACTS FROM EXPORTS REDUCED TO ZERO

Informa used its long-term forecasts for ethanol and corn as a baseline in which to compare the proposed impacts of retaliatory ethanol import tariffs resulting from RINS being applied to exports. Informa's baseline long term forecasts are a comprehensive global view of agricultural production, consumption, trade and ending stocks. They account for the iterative interaction of different commodities across time, under a set of assumptions, with the attempt to provide an unbiased forecast of the global agricultural system.

For this study Informa assumes US ethanol exports would be reduced to zero for calendar years 2018, 2019, 2020 and 2021. Informa's baseline assumption projects annual ethanol exports to average 975 million gallons per calendar year over that time frame. The reduction in exports is offset by an equal reduction in ethanol production of 3,596 million gallons over the four calendar years. This reduction in calendar year production was prorated to align with the US corn marketing years of 2017/18, 2018/19, 2019/20, and 2020/21 (Exhibit 1).

Exhibit 1: U.S. Ethanol Supply and Demand, Forecast 2017/18 to 2020/21
In Million Gallons

	2017/18		2018/19		2019/20		2020/21	
	Baseline	Scenario	Baseline	Scenario	Baseline	Scenario	Baseline	Scenario
Carryin (Sep 1)	920	920	1,024	1,024	920	920	944	944
Production	15,494	14,852	15,505	14,555	15,413	14,443	15,342	14,308
Imports	100	100	100	100	100	100	100	100
Total Supply	16,515	15,872	16,629	15,680	16,433	15,463	16,385	15,351
Domestic Disappearance	14,540	14,540	14,759	14,759	14,519	14,519	14,401	14,401
Exports	950	308	950	0	970	0	1,034	0
Total Use	15,490	14,848	15,709	14,760	15,489	14,519	15,435	14,401
Carryout (Aug 31)	1,024	1,024	920	920	944	944	950	950

Source: Informa Economics IEG

Informa applied the above adjustments in ethanol production to its corn supply and demand baseline (Exhibit 2) as follows:

- Informa reduced its baseline corn for fuel ethanol forecast by the same amount it reduced its ethanol production forecast, assuming a yield of 2.84 gallons of ethanol per bushel of corn. The net reduction in corn used for ethanol totaled 1,265 million bushels over the study period from the baseline assumption of 21,494 million bushels or a reduction of 5.8 percent.

- The other usage components of feed and residual and exports were modeled taking into account lagged corn prices and a weighted change in available supplies (to take into account loss of domestic DDGs production).
  - Feed and residual usage was projected to increase by 452 million bushels over the study period (offsetting 36% of the loss from corn to fuel ethanol).
  - Export usage was projected to increase 270 million bushels (offsetting 21% of the loss from corn to fuel ethanol).

Exhibit 2: U.S. Corn Supply and Demand, Forecast 2017/18 to 2020/21

In Million Acres/Million Bushels

	2017/18		2018/19		2019/20		2020/21	
	Baseline	Scenario	Baseline	Scenario	Baseline	Scenario	Baseline	Scenario
Planted Acres	90.7	90.7	91.9	90.9	91.3	90.8	92.3	91.8
Harvested Acres	83.2	83.2	84.5	83.5	83.8	83.3	84.8	84.3
Yield	170.5	170.5	172.2	172.2	173.6	173.6	172.3	172.3
Carryin (Sep 1)	2,295	2,295	2,222	2,426	2,296	2,400	2,132	2,344
Production	14,182	14,182	14,549	14,377	14,549	14,462	14,602	14,516
Imports	45	45	40	40	40	40	40	40
Total Supply	16,522	16,522	16,812	16,843	16,885	16,902	16,774	16,900
Feed & Residual	5,550	5,559	5,590	5,760	5,815	5,905	5,718	5,901
Food/Seed/Ind	6,874	6,648	6,885	6,551	6,903	6,562	6,934	6,569
Ethanol for Fuel	5,405	5,179	5,405	5,071	5,368	5,026	5,316	4,952
Domestic Use	12,424	12,207	12,475	12,311	12,718	12,467	12,652	12,471
Exports	1,875	1,889	2,040	2,132	2,035	2,091	2,199	2,307
Total Use	14,299	14,096	14,515	14,443	14,753	14,558	14,851	14,778
Carryout (Aug 31)	2,222	2,426	2,296	2,400	2,132	2,344	1,924	2,122
Stocks/Use	15.5%	17.2%	15.8%	16.6%	14.5%	16.1%	13.0%	14.4%
Futures Price ($/Bu)	$3.50	$2.94	$3.50	$3.22	$4.04	$3.46	$3.97	$3.54
Farm Price ($/Bu)	$3.35	$2.79	$3.45	$3.17	$3.89	$3.31	$3.82	$3.39
Farmer Revenue (Mil USD)	$47,510	$39,505	$50,194	$45,625	$56,588	$47,810	$55,742	$49,147

Source: Informa Economics IEG

- New farm and futures prices were projected for each marketing year based on the forecasted stocks to use ratio from each year taking into account the net change in usage and any change in corn production.

Informa Economics IEG | Agribusiness Intelligence

○ Corn area was forecasted using the prior year's change in price.

❑ For example, 2018/19 corn area was reduced by one million acres from the baseline assumption given a 56-cent reduction in 2017/18 marketing year average prices.

Informa projects that the possible loss to farm revenue from the above adjustments in corn production could be equivalent to $27.9 billion over the four corn marketing years starting in 2017/18.

■ The change in baseline farm revenue from corn production was calculated using the baseline farm level price forecasts multiplied by baseline corn production forecasts less the new price forecasts multiplied by the new production forecasts (that account for the aggregate changes in corn supply and demand due to the ripple effects of a reduction in ethanol exports).

■ The reduction in fuel ethanol exports, will likely cause a one-to-one reduction in fuel ethanol production, which will require less corn to be used for ethanol.

■ The reduced demand for corn from ethanol will be partially offset with higher feeding and exports (both due to less DDGs as well as lower prices), with the remaining portion being added to ending stocks.

■ Higher ending stocks will result in lower prices, the lower prices will likely result in reduced planted area in the following year, limiting some of the impact.

■ The net result will be less farmer revenue from corn production.

V. ECONOMIC CONTRIBUTION OF ETHANOL EXPORTS

In 2016, the U.S. ethanol industry exported nearly 1.2 billion gallons of ethanol, totaling over $1.7 billion in sales received by ethanol producers. In the process of producing this ethanol for export, the industry created over 3.3 million tons of distillers' grains (DDGS) and over 220 million pounds of distiller's corn oil (DCO) combining for a value of over $630 million. In order to manufacture this large volume of ethanol for export, ethanol manufacturers purchased over 411 million bushels of corn from U.S. corn farmers. This means that the ethanol industry purchased over $1.5 billion of corn from U.S. farmers to export ethanol during a time of low commodity prices and increasing downward pressure on net farm income. However, the impact that ethanol exports have on the economy does not stop there; as ethanol producers purchase inputs from other industries, these industries will in turn make their own input purchases and pay wages to their employees. This will continue as these "ripple effects" churn through the economy generating support to business sales, GDP, and employment for many other industries.

For every $1 in sales associated with ethanol exports, an additional $2.53 is added to overall U.S. business sales.

Results from the IMPLAN model examining the contributions of ethanol exports confirm the importance of the ethanol industry to the U.S. national economy. In 2016, U.S. ethanol exports directly employed over 850 full time equivalent (FTE) jobs while generating GDP of $278 million and business sales of nearly $2.3 billion.

Exhibit 3: Economic Contributions associated with U.S. Ethanol Exports

	FTE Jobs	Labor Income (Million $)	GDP (Million $)	Sales (Million $)
Direct	855	$ 69.7	$ 278.3	$ 2,284.3
Indirect	16,868	$ 912.9	$ 1,591.4	$ 4,363.5
Induced	7,735	$ 440.5	$ 772.8	$ 1,418.1
Total	25,458	$ 1,423.0	$ 2,642.4	$ 8,065.9

Source: USDA, IMPLAN, and Informa Economics IEG

The total economic contributions (direct, indirect, and induced contributions) created by ethanol exports show the true importance of these exports to the overall U.S. economy. By including the impacts to industries that are linked (either by indirect or induced spending) to ethanol exports the 2016 output value of $2.3 billion is magnified to a figure of $8.1 billion in

economic output. That is, the economic "ripple effects" of the ethanol exports are 2.5 times as large as the value of ethanol and exports. Another way to think of these effects is that for every $1 of sales associated with ethanol exports, another $2.53 in output (industry sales) is supported elsewhere the United States economy.

The economic contributions are not limited solely to business sales. As shown in Exhibit 3, the total impact of ethanol exports indirectly supported over 25,000 jobs across the U.S. and $2.6 billion in GDP in 2016. These additional "ripple effects" are generated in two ways: as indirect effects and as induced effects. As previously discussed, indirect effects are the result of the ethanol industry purchasing inputs such as corn, natural gas, denaturant, and other important inputs. Induced effects occur when wages that the ethanol industry and other indirect industries pay their employees are spent elsewhere in the economy. When interpreting these indirect and induced numbers, it should be noted that as opposed to being directly generated by ethanol production for export (such as the direct impacts), these effects are instead indirectly supported by the ethanol industry. Since ethanol tends to be more capital intensive as opposed to labor intensive, it can contribute to larger total output with less direct employees; this leads to large indirect and induced jobs indirectly supported elsewhere from a smaller number of individual employees.

If ethanol produced for exports were reduced to zero, the significant contributions to the rest of the U.S. economy would be in jeopardy. Under these assumptions, the direct contributions associated with ethanol exports would disappear, and there would be approximately 1 billion gallons less of ethanol produced. Additionally, the indirect and induced contributions associated with these ethanol exports would come under threat, and would very likely be adversely impacted.

Informa Economics IEG
2121 K Street NW
Suite 300
Washington, DC 20037

T +1 202 899 6937
E info@informa.com
W www.agribusinessintelligence.com