MEETING FEEDSTOCK SUPPLIES FOR THE RFS, AND POTENTIAL NEW SOURCES

DES MOINES, IOWA
SEPTEMBER 19, 2019
RFS STATUTORY FACTORS

(1) environmental impacts;
(2) U.S. energy security;
(3) expected annual rate of future commercial production of each biofuel category;
(4) impacts on U.S. infrastructure for goods other than renewable fuels and sufficiency of infrastructure for renewables;
(5) consumer cost of transportation fuels and transport of goods; and
(6) other factors including jobs, crop supply and price, rural economic development, and food prices.
HOW I FEEL MANY TIMES WITH THE ANNUAL RVO RULEMAKING....
we are attempting to minimize the incentives for the RFS program to increase the supply of advanced biodiesel and renewable diesel through feedstock switching
FEEDSTOCK OPTIONS
EPA APPROVED PATHWAYS

- Distillers Corn Oil
- Yellow Grease
- Camelina
- Soybean Oil
- Animal Fats
- Canola Oil
FEEDSTOCK OPTIONS
EPA APPROVED PATHWAYS

- Soybean yields consistently above trend line.
- Current supplies are extremely large
  - Project ending stocks this marketing year are 567 million bushels greater than ending stocks last year.
- Excess soy oil supplies in the future are expected to grow unless new demand created.
HOW BIG IS CURRENT SUPPLY?

Soybean, Ending Stocks

567 million bushels = 850 million gallons of potential fuel (in seed)
what about lack of exports to china?

we did not include the potential biodiesel or renewable diesel that could theoretically be produced from the oilseeds and vegetable oil projected to remain in the U.S. due to reduced trade of these products in our projection of the reasonably attainable volumes. This is because any biodiesel and renewable diesel produced from soybeans previously exported to China are necessarily diverted from other uses.
# Future Excess Supply

Table 1: U.S. soybean oil supply/demand and surplus for biodiesel (billion pounds)

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soy oil production (oil-in-seed)</td>
<td>44.19</td>
<td>48.35</td>
<td>49.42</td>
<td>48.83</td>
<td>52.86</td>
<td>57.07</td>
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<tr>
<td>Imports</td>
<td>0.29</td>
<td>0.32</td>
<td>0.32</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>Production</td>
<td>21.95</td>
<td>22.12</td>
<td>23.44</td>
<td>23.95</td>
<td>27.98</td>
<td>32.18</td>
</tr>
<tr>
<td>Supply</td>
<td>22.24</td>
<td>22.44</td>
<td>23.75</td>
<td>24.26</td>
<td>28.29</td>
<td>32.49</td>
</tr>
<tr>
<td>Consumption</td>
<td>20.59</td>
<td>19.89</td>
<td>20.24</td>
<td>22.03</td>
<td>23.25</td>
<td>24.56</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>6.10</td>
<td>6.23</td>
<td>6.54</td>
<td>7.57</td>
<td>7.57</td>
<td>7.57</td>
</tr>
<tr>
<td>Exports</td>
<td>2.24</td>
<td>2.56</td>
<td>2.45</td>
<td>2.40</td>
<td>2.40</td>
<td>2.40</td>
</tr>
<tr>
<td>Surplus</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.63</td>
<td>5.53</td>
</tr>
<tr>
<td>Surplus (biodiesel equivalent, billion gallons)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.36</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Source: LMC International
FEEDSTOCK OPTIONS
EPA APPROVED PATHWAYS

• USDA Economic Research Service reported the pork industry has been setting quarterly inventory records almost since 2015.
• This trend exists for the beef and poultry industry as well.
• Animal fat supplies are directly correlated with meat production and US processing capabilities.
• Longer term, the National Renderers Association projects rendered fat supplies (animal fats and used cooking oil) to increase by 14% over the next decade.
NBB partnering with National Renderers Association to examine AF, UCO, and Interceptor Grease Supplies.

DIS out of Des Moines, IA doing the work.
FEEDSTOCK OPTIONS
EPA APPROVED PATHWAYS

- Prior to commercialization of the biodiesel market, DCO was not generated in the US in significant quantities.
- DCO output saw rapid growth between 2010 and 2017, as most ethanol plants invested in extraction capacity and improvements in technology increased yields.
- Growth will occur with mid-level ethanol blends, export growth, and potential for increased extraction rates (lbs/bu).
WHAT ABOUT PALM OIL?
WHY ARE WE TALKING ABOUT PALM OIL IN CENTRAL IOWA?
HAS THE RFS ENCOURAGED EXPANSION? NO

Diagram 5: Growth in S.E. Asian oil palm areas, 2008-2018 vs. RFS2 biodiesel mandate

- For Indonesia, the correlation coefficient is -85.1%, which indicates a very strong negative relationship.
- For Malaysia, the correlation coefficient is -62.5%, again a strong negative relationship.
- These results demonstrate that there is no evidence that the rising RFS2 mandate acted as a spur to the rate of oil palm planting.

Dr. James Fry—LMC International, August 2019
The main driver of the growth of palm oil imports into the U.S. was not for the biodiesel sector, but was for transfat-free food uses.

The palm oil replaced partially hydrogenated oils, which were principally manufactured from soybean oil, but now faces competition from high oleic oils.
SOME OF THE CONCLUSIONS FROM LMC INTERNATIONAL

- There is no correlation at all between the rates of growth of oil palm areas and the increases in the volumes of biodiesel specified under the RFS2 mandates.
  - The correlation coefficient for Indonesia is -85.1%, and for Malaysia -62.5%. This proves that there is no empirical evidence at all that a higher RFS2 mandate has stimulated a higher level of oil palm plantings.

- Palm biodiesel is not permitted for use in the D4 or D5 mandates. Therefore, all RFS2 demand for palm methyl ester (PME) occurs in the D6 mandate, where the eligible supplies are grandfathered from the earlier RFS.

- There was just one year since 2010 in which PME imports entered outside the RFS2 mandate. This was in 2013, when the $1/gallon blending credit and the temporary cheapness of palm oil against U.S. heating oil made it profitable to ship PME to the U.S. outside the RFS2 framework. The 2018 trade determination by the International Trade Commission, which imposed anti-dumping duties on Indonesian PME imports has eliminated these imports.

- In summary, we conclude that the expansion in oil palm areas and the growth in palm oil imports into the U.S. are not at all related to the RFS2 policy.
FEEDSTOCK OPTIONS
PATHWAYS WITH PETITION OR STATUTORY CONSIDERATION

- Corn Oil — Wet Milling
- Cottonseed Oil
- Brassica carinata
- CoverCress™
- Algae
EXAMPLE OF WINTER ANNUAL OILSEED

COVERCRESS
Introducing the 1\textsuperscript{st} cash cover crop for the Midwest

Producing a low carbon intensity crop on unused land over winter
What is it? CoverCress is a winter oilseed, relative of canola

Derived from collection of native pennycress → 5 years of breeding and field testing → Genome editing program with university partnerships (non-GMO) → CoverCress!

Main collections in 2013-14

On track for 1st commercial planting in 2021

- Courtesy of CoverCress -
CoverCress fits between corn harvest and soybean planting using common equipment, keeping low production costs

- Seed spread on the surface
- Farmer’s normal fall practices (tillage no-till)
- Fall and early spring cover
- Only 50 units of N in early spring
- Scavenges about 30% of its nitrogen from remaining after corn
- Harvested by a soybean combine in May
- Local collection site, processed in Midwest crush plant
- Full season no-till soybeans planted immediately following CoverCress harvest

EXPECT TO BE AMONG THE LOWEST MARGINAL COST CROPS TO PRODUCE OIL AND MEAL DUE TO OVERWINTER USE OF LAND
<table>
<thead>
<tr>
<th>Cycle 1 (2017-19)</th>
<th>2017 key parent identified (line #2032)</th>
<th>Cycle 2 progeny from line #2032</th>
<th>Next generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle 1 lines harvested May 24-31 in southern half of target zone</td>
<td>#2032 Consistently 5-10 days earlier, and with high yields</td>
<td>To be planted in Fall 2019</td>
<td>Precise gene editing after early maturity genes are identified</td>
</tr>
</tbody>
</table>

Less mature Plants from same family segregate, allowing selection More mature

2017 key parent identified (line #2032)

#2032 Consistently 5-10 days earlier, and with high yields

To be planted in Fall 2019

Expect to be 5-10 days ahead of Cycle 1

Precise gene editing after early maturity genes are identified

Courtesy of CoverCress
CoverCress oil carbon intensity score is expected to be near 30g CO$_2$/MJ, nicely fitting into low carbon fuel standard markets.

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**Table 3. The Cl of CoverCress biodiesel production.**

<table>
<thead>
<tr>
<th>Cl (g CO$_2$e/MJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Cl</td>
</tr>
<tr>
<td>30.23</td>
</tr>
</tbody>
</table>
OTHER ECONOMIC TOPICS
The Economic Impact of the Biodiesel Industry on the U.S. Economy

Study for:
National Biodiesel Board
Washington, D.C.

August 2019

Research and analysis to inform your business decisions
BIODIESEL: GOOD FOR FARMERS AND LIVESTOCK PRODUCERS

- Soybean: 11% increase
- Soy Meal: -$21/ton
- Feeder: $20/head
- Wean-to-Finish: $2.78/head
- Farrow-to-Wean: $0.50/head
HOW I FEEL MANY TIMES WITH THE ANNUAL RVO RULEMAKING....
Impact of Biodiesel Use of Tallow on the Beef Supply Chain

Price transmission throughout the beef supply chain passes the upstream price changes downstream ultimately to the producer.
FEEDSTOCK OPTIONS
EPA APPROVED PATHWAYS

- LMC international projects that the global waste oil supply will grow from 29.0 million metric tons in 2017 to 31.9 million metric tons in 2020. 31.9 million metric tons of waste oil would be enough to create 9.6 billion gallons of biomass-based diesel.
- Changing consumer demand for vegetarian fed meat has decreased feed demand for yellow grease. Industry indicates this trend is forecasted to continue.