Economic Impact of Biodiesel on the United States Economy 2022: Main Report

Report for:

Clean Fuels Alliance America

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Main Report

Introduction

For this study, our goal is to evaluate the economic impact of the biodiesel sector on the United States economy. We assess the effect under a range of scenarios, including the impact if domestic production increased to a maximum of six billion gallons[1].

This study assesses the impact of the biodiesel industry in three separate ways for a given year:

1. ***Economic impact:*** this measure quantifies the value added to the United States economy by the biodiesel value chain.

2. ***Employment impact****:* this measure estimates the number of full-time equivalent (FTE) jobs contributed by production, processing and distribution of biodiesel and its feedstocks.

3. ***Wage impact****:* this measure evaluates the total wages for individuals employed along the biodiesel value chain.

In addition to these annual benefits, we also attempt to quantify:

4. ***Temporary impact****:* the effect on the economy, employment and wages from the construction of new biodiesel facilities. This is a one-off (rather than annual) effect.

Throughout this report, we present our results for the first three of these economic indicators as the ***total effect***, or sum, of three separate measures*:* the direct, indirect and induced effects below:

- ***Direct effects:*** These are the economic, employment and wage impacts that can be directly attributed to the biodiesel value chain. These would include, for example, jobs and wages of people working in biodiesel processing facilities, and the value of oilseed crops grown for use in biodiesel. Although these direct effects are significant, they fail to capture the full impact of the "ripple" effect that the biofuel industry has on supporting industries. We term these the "indirect" effects…

- ***Indirect effects:*** These are the economic, employment and wage impacts created by those industries that supply the biodiesel value chain, or by individuals who work at the periphery of the sector. For some steps in the biodiesel value chain, the indirect effect can be quite large, such as capital-intensive sectors like oilseed crushing and crude oil refining, where many jobs are associated with keeping facilities operational, from white collar jobs in engineering to the work of trade professionals like electricians, plumbers, and pipefitters working on a contractual basis.

- ***Induced Effects:*** Direct effects also fail to capture the economic activity stemming from expenditures of households drawing a salary from a given sector. In our case, employees in the biodiesel value chain spend their income in the wider economy, generating value added and jobs. While these induced effects are typically smaller than indirect effects, they can still constitute a sizeable benefit, particularly when the sector being evaluated is large, as is the case for biodiesel.

Note: The term "biodiesel" in this report refers to the combined renewable diesel (RD) and fatty acid methyl ester (FAME) industries. In some instances, we refer to each of these two fuel sources separately, by name.

[1] This scenario assumes that installed capacity increases to 7.5 billion gallons, with 80% utilization.

Summary of total impact

Based on actual 2021 production, imports and consumption in the United States:

- The biodiesel sector contributed a **total U.S. economic impact of $23.2 billion, 75,200 U.S. jobs, and $3.6 billion in wages paid**.
- This impact is generated by actual 2021 U.S. biodiesel production of 2.5 billion gallons and imports of 0.6 billion gallons (20% of the total supply), giving total U.S. biodiesel supply of 3.1 billion gallons. If all 3.1 billion gallons had been produced in United States, the total economic impact would have increased to $29.7 billion (an increase of $6.5 billion compared with the 20% import share, supporting 93,800 jobs (an increase of 18,600), and $4.4 billion in wages paid (an increase of $0.9 billion).

We include three further scenarios, with **3.5, 4.0 and 6.0 billion gallons of total biodiesel supply**, respectively. These scenarios also estimate the impact if U.S. production/imports are maintained at an 80%/20% split and, alternatively, if production is 100% within United States. The impact of U.S. biodiesel supply of **6.0 billion gallons** is estimated at**:**

- *If the share of domestic production vs. imports remains at the actual 2021 split of 80% production and 20% imports*, this scenario generates $49.0 billion in total U.S. economic impact, 150,000 U.S. jobs, and $7.1 billion in U.S. wages paid.
- *However, if all 6.0 billion gallons were produced domestically (i.e. no biodiesel imports)*, the effects would increase to $61.6 billion in total economic impact (an increase of $12.6 billion compared with the actual 20% import share), supporting 187,000 jobs (an increase of 36,000), and $8.8 billion in wages paid (an increase of $1.7 billion).

As well as the higher value added and jobs created in these scenarios, **new biodiesel facilities would need to be built** to accommodate this additional production. With 7.5 billion gallons of capacity to supply 6.0 billion domestic gallons:

- We estimate this building activity would create as many as 144,500 temporary jobs, $5.8 billion in temporary wages paid, and $4.3 billion in temporary economic activity.

Use of multipliers to evaluate indirect and induced impacts

To capture indirect and induced effects, economists use multipliers, which are developed from “input-output” tables and measure the impact on the broader economy from some kind of exogenous shock to a specific sector of the economy. Because input-output tables and economic multipliers are the convention when estimating indirect and induced effects, they are available for many economies globally. In the case of the United States, multipliers are made available by the United States Department of Commerce’s Bureau of Economic Analysis across 406 detailed industries and, in most cases, by state.

Table 1 presents the most important multipliers used in this study, along with the industry classification NAICS code. To capture indirect and induced effects, these multipliers are applied to the direct effects that LMC has calculated.

Table 1: Effective multipliers (state-weighted averages) used to calculate results for this study

		TOTAL = Direct+Indirect+Induced		
NAICS	Codes & Activities	Economic	Employment	Wage
31122A	Crushing	2.79	5.96	4.28
311225	Refining	2.67	5.00	4.06
482000	Rail	1.93	3.97	2.50
31161A	Animal Processing	n.a.	4.30	4.09
1111C0	Oilseed Farm	2.08	3.26	3.19
484000	Trucking	2.14	2.41	2.20

Estimating economic impact with different scenarios for production and imports

The study estimates economic benefits under various scenarios representing different levels of production and imports. For most steps within the value chain, with feedstock production being a good example, the relationship between production and economic impact is linear, i.e. a doubling of oil used in biodiesel results in a doubling of the economic impact. However, for some categories, notably oilseed and biodiesel processing, there are economies of scale at the factory level: we have allowed for these after consultation with industry participants.

Assumptions for renewable diesel (RD) volumes

Under all our scenarios (except for the actual 2021 actual baseline case where we use the actual current split of 67% FAME and 33% RD), ***we assume that RD represents half of domestic U.S. biodiesel production***. As for the location of this output, we are informed by the United States Department of Agriculture's (USDA) data on renewable diesel volumes as well as LMC capacity databases and discussions with industry personnel. USDA uses trade data for renewable diesel from the Department of Energy (DOE) and the United States Department of Energy's Energy Information Administration (EIA), and production data derived from industry contacts.

Accounting for the difference in prices between renewable diesel and biodiesel

RD is currently sold at a premium to FAME biodiesel in United States. However, unlike biodiesel prices, renewable diesel prices are not widely published. Therefore, in order to capture the higher margins from renewable diesel production, we calculate the implied prices for renewable diesel using the annual financial reports of the leading producers and adopt this as a proxy for U.S. market prices of renewable diesel.

Nonetheless, the full effect of higher RD prices does not feed into the processing margin because renewable diesel requires more feedstock per unit of diesel produced. While biodiesel (FAME) uses one unit of feedstock for almost one unit of diesel production, renewable diesel requires approximately 1.2 units of feedstock for a given unit of diesel production. These differences in efficiency, along with the differences in by-product production have been captured in the model.

Estimating the added jobs derived from renewable diesel production

RD production is more complex than FAME production due to the greater number of chemical processes required. In order to manage these chemical processes, RD plants typically employ more workers than comparable FAME plants. Discussions with senior representatives of RD plants in the United States allowed us to estimate the added jobs from RD production, and factor these into the model.

The biodiesel value chain

We estimate the economic impact of biodiesel on the United States economy by considering the value chain necessary for its production and distribution. We evaluate the benefits for each sector along the value chain, spanning the production, collection and processing of raw materials — oilseeds, animal fats and waste oils — to biodiesel production, distribution, importation and exportation. These steps in the value chain are listed in Table 2, along with a brief description of each.

We have excluded the contribution from the oilseed meal component when evaluating the impact from the production and crushing of oilseeds. We focus only on the ***oil share*** of value created in oilseeds (and inedible oil for corn) as this is the biodiesel feedstock.

Table 2: The biodiesel value chain

Value chain stage	Description
Oilseed production	Value of the oil produced for biodiesel feedstock in oilseeds. As meal is outside the scope of the biodiesel chain, its value is excluded
Animal processing and waste grease delivery	Processing and rendering of animal carcasses and fats into feedstocks for biodiesel use as well as collection of waste greases
Local oilseed delivery	Delivery of oil share of oilseeds used in biodiesel to local elevation facility
Elevation	Elevation and storage of oil component of oilseed used in biodiesel production
Oilseed crush	Value of removing oil from oilseed in the crush process for use as a biodiesel feedstock
Feedstock delivery by barge	Long range delivery of oil share of biodiesel feedstocks by barge
Feedstock delivery by rail	Long range delivery of oil share of biodiesel feedstocks by rail
Biodiesel processing, with feedstock collection	Collection and processing of feedstocks, including waste greases, into biodiesel
Rail deliveries of domestic biodiesel	Rail shipments of domestic biodiesel from surplus to deficit states (mostly originating in Midwest)
Rail deliveries of glycerin	Rail shipments of domestic glycerin from surplus to deficit states (mostly originating in Midwest)
Rail deliveries of imported Biodiesel	Rail shipments of imported biodiesel from surplus to deficit states (mostly originating in Gulf)
Rail deliveries of exported Biodiesel	Rail shipments of domestic biodiesel from surplus states to port of export (mostly originating in Midwest)
Trucking domestic biodiesel to sale	Trucking of domestically produced biodiesel (mostly blended with conventional diesel) from terminal to dealer outlet
Trucking imports to sale	Trucking of imported biodiesel (mostly blended with conventional diesel) from terminal to dealer outlet
Import port activities	Unloading ocean-going vessels laden with biodiesel imports
Export port activities	Loading ocean-going vessels with biodiesel shipments for export

Scenarios used in analysis

We calculate the economic, jobs and wages impact associated with biodiesel supply in United States. The effects are presented for each step in the value chain, under various supply scenarios for the United States market:

- 3.1 billion gallons of biodiesel (the actual 2021 figure, which we term the "actual" or "baseline" scenario)
- 3.5 billion gallons
- 4.0 billion gallons
- 6.0 billion gallons

The effect of each of these scenarios is calculated twice:

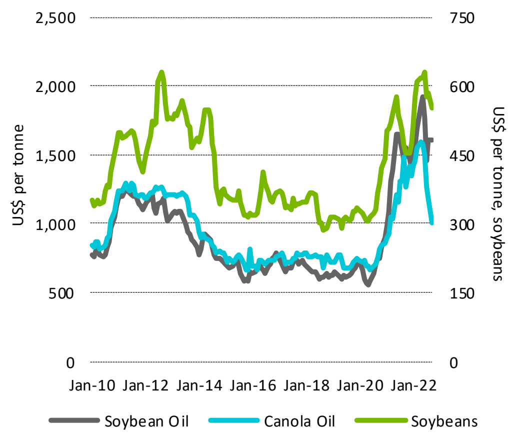
- For the actual 2021 U.S. production/import split of 80% domestic biodiesel and 20% imported biodiesel. (The actual figure for the model is 80.6% domestic, but we use the term "80%" for ease throughout this report.)
- Assuming that 100% of biodiesel is produced domestically in United States, i.e. no imported biodiesel.

We also estimate the ***temporary impact*** of constructing the additional biodiesel capacity that would be required to produce six billion gallons domestically (i.e. 7.5 billion gallons capacity with an 80% Utilization rate).

The 2021 market conditions underpinning these projections

The key determinants of the economic value added at several stages of the value chain are prices (and thus margins) multiplied by volumes. In simple terms, therefore, higher prices/margins and higher volumes create economic greater value added. This analysis was undertaken using 2021 data as for prices and as a basis where volumes and capacity distribution are required.

Diagram 1: Soybean and soybean/canola oil prices



As we see in Diagram 1, prices were generally elevated in this period, boosting value added: however, we should remember that the output price of one sector (e.g. farming oilseeds) is the input price for the next sector (e.g. oilseed crushing). Thus, margins are often offset by high prices from the prior sector in the chain.

Prices for vegetable oils and oilseeds in 2021 were at their highest levels since 2013, illustrated by soybeans and soy and canola oil in Diagram 1. When commodity prices ease, we can expect the economic impacts of the biodiesel industry to decline, especially in the farm sector, other things being equal.

Key results

Total benefits

The economic benefits contributed by the biodiesel sector to the United States economy are significant. For 2021, the actual situation, represented by the baseline case, has U.S. production of 2.5 billion gallons and actual imports of 0.6 billion gallons. For this year, we estimate that:

- The biodiesel sector provides **$23.2 billion in economic activity** to the United States economy.
- The biodiesel sector sustains **75,200 jobs** and supports **$3.6 billion in wages paid**.

This “actual” case reflects the market in 2021, based on estimates of FAME biodiesel production from the EIA and imports from the United States International Trade Commission (USITC). Renewable diesel production and import volumes are based on estimates from United StatesDA and LMC research.

Most of the value-added activity associated with imported biodiesel takes place overseas and, therefore, on a per-gallon basis, the economic impact of domestic biodiesel production greatly exceeds that of imported biodiesel. Therefore, if U.S. consumption were to remain at the current level of 3.1 billion gallons, the potential benefit from shifting to 100% domestic production *could* ***add*** *as much as*:

- $6.5 billion in economic activity
- 18,600 further jobs supported
- $0.9 billion in support to wages paid

The benefits of shifting away from imported biodiesel to 100% domestic production become even greater as the size of the United States biodiesel market increases. For example, with **6.0 billion gallons of U.S. supply**, shifting supply from 80% domestic production to 100% domestic could support *an additional*:

- $12.6 billion in economic activity
- 36,400 jobs
- $1.7 billion in wages paid

These results are presented in Table 3 below.

Table 3: Summary of total impact of biodiesel on the United States economy

	Using actual 2021 domestic production (80%) vs imports (20%)				Assuming 100% domestic production			
	Actual	Scenarios			Actual	Scenarios		
Biodiesel								
US production (bn gallons)	2.5	2.8	3.2	4.8	3.1	3.5	4.0	6.0
US imports (bn gallons)	0.6	0.7	0.8	1.2	0.0	0.0	0.0	0.0
Total U.S. supply (bn gallons)	3.1	3.5	4.0	6.0	3.1	3.5	4.0	6.0
Impact								
Economic (billion $)	23.2	27.0	31.4	49.0	29.7	34.3	39.8	61.6
Job (FTE)	75,196	86,204	99,078	150,572	93,755	107,373	123,299	187,003
Wage (billion $)	3.6	4.1	4.7	7.1	4.4	5.1	5.8	8.8
Increase (100% U.S. output vs actual of 20% imports)								
Economic (billion $)	n.a.	n.a.	n.a.	n.a.	6.5	7.4	8.4	12.6
Job (FTE)	n.a.	n.a.	n.a.	n.a.	18,559	21,169	24,222	36,431
Wage (billion $)	n.a.	n.a.	n.a.	n.a.	0.9	1.0	1.1	1.7

FTE = full-time equivalent.

Benefits by stage in biodiesel value chain

In the following series of tables, we split the aggregate results presented above into the different stages of the biodiesel value chain. Some of the key results for the sectors that contribute most to the totals are summarized below.

For the actual 2021 situation for U.S. biodiesel supply (3.1 billion gallons, where 80% — 2.5 billion gallons — is supplied domestically), the farm-level ***oilseed production sector*** benefits from biodiesel supply to the tune of:

- $7.41 billion in economic impact (30% of the total economic impact of biodiesel)
- 28,236 jobs, 38% of the total
- $1.36 billion, 38% of the total support to wages paid.

The oilseed production sector (the farm-level of the value chain) is therefore a substantial beneficiary of the value and jobs created by biodiesel activities.

Moving along the value chain to the ***processing or crushing of oilseeds,*** where we consider only the value added to the *oil* component in the crush, under the actual 2021 base case of 3.1 billion gallons, the United States biodiesel industry creates:

- $4.97 billion in economic activity, 21% of the total economic impact of biodiesel
- 6,000 jobs, 8% of the total
- $380 million, 11% of wages paid.

Further along the biodiesel value chain, we come to the ***processing of vegetable oils, animal-based feedstocks and waste greases into biodiesel***.

Under the actual 2021 base case of 3.1 billion gallons, the United States biodiesel industry adds:

- $9.57 billion in economic activity, 41% of the total economic impact of biodiesel
- 17,120 jobs, 23% of the total
- $880 million in wages paid, 25% of the total.

Table 4: Economic activity supported by the United States biodiesel sector (using actual 2021 supply composition of 80% U.S. domestic production and 20% imports)

	Actual 2021 Supply	Supply scenarios (80%/20% US/import split)		
US supply (billion gallons)	**3.1**	**3.5**	**4.0**	**6.0**
- U.S. production	*2.5*	*2.8*	*3.2*	*4.8*
- Imports	*0.6*	*0.7*	*0.8*	*1.2*
Economic impact (billion U.S. dollars)	**23.23**	**27.00**	**31.40**	**49.03**
Oilseed production	7.41	8.55	9.88	15.20
Animal processing and waste grease delivery	n.a.	n.a.	n.a.	n.a.
Local oilseed delivery	0.18	0.20	0.23	0.33
Elevation	0.25	0.29	0.33	0.49
Oilseed crush	4.97	5.77	6.71	10.47
Feedstock delivery by barge	0.03	0.04	0.05	0.08
Feedstock delivery by rail	0.10	0.13	0.16	0.28
Biodiesel processing, with feedstock collection	9.57	11.23	13.17	20.93
Rail deliveries of domestic biodiesel	0.43	0.50	0.57	0.87
Rail deliveries of glycerin	0.05	0.06	0.07	0.11
Rail deliveries of imported biodiesel	0.01	0.01	0.01	0.02
Rail deliveries of exported biodiesel	0.02	0.02	0.02	0.01
Trucking domestic biodiesel to sale	0.13	0.14	0.14	0.16
Trucking imports to sale	0.03	0.04	0.04	0.06
Import port activities	0.01	0.01	0.02	0.02
Export port activities	0.00	0.00	0.00	0.00

Table 5: Economic activity supported by the United States biodiesel sector (assuming 100% U.S. domestic production and zero imports)

	Actual 2021 Supply, but 100% US	Supply scenarios (100%/0% US/import split)		
US supply (billion gallons)	**3.1**	**3.5**	**4.0**	**6.0**
- U.S. production	*3.1*	*3.5*	*4.0*	*6.0*
- Imports	*0.0*	*0.0*	*0.0*	*0.0*
Economic impact (billion U.S. dollars)	29.68	34.35	39.81	61.64
Oilseed production	9.38	10.79	12.44	19.04
Animal processing and waste grease delivery	n.a.	n.a.	n.a.	n.a.
Local oilseed delivery	0.22	0.25	0.28	0.41
Elevation	0.31	0.36	0.41	0.61
Oilseed crush	6.36	7.35	8.52	13.18
Feedstock delivery by barge	0.05	0.06	0.07	0.11
Feedstock delivery by rail	0.15	0.18	0.22	0.37
Biodiesel processing, with feedstock collection	12.44	14.50	16.91	26.53
Rail deliveries of domestic biodiesel	0.54	0.62	0.71	1.08
Rail deliveries of glycerin	0.07	0.08	0.09	0.13
Rail deliveries of imported biodiesel	0.00	0.00	0.00	0.00
Rail deliveries of exported biodiesel	0.02	0.02	0.02	0.01
Trucking domestic biodiesel to sale	0.14	0.15	0.15	0.17
Trucking imports to sale	0.00	0.00	0.00	0.00
Import port activities	0.00	0.00	0.00	0.00
Export port activities	0.00	0.00	0.00	0.01

Table 6: Jobs supported by the United States biodiesel sector (using actual 2021 supply composition of 80% U.S. domestic production and 20% imports)

	Actual 2021 Supply	Supply scenarios (80%/20% US/import split)		
US supply (billion gallons)	**3.1**	**3.5**	**4.0**	**6.0**
- U.S. production	*2.5*	*2.8*	*3.2*	*4.8*
- Imports	*0.6*	*0.7*	*0.8*	*1.2*
Employment impact (FTE jobs)	75,196	86,204	99,078	150,572
Oilseed production	28,236	32,308	37,070	56,119
Animal processing and waste grease delivery	14,661	17,951	21,799	37,190
Local oilseed delivery	1,170	1,410	1,692	2,817
Elevation	2,905	3,502	4,200	6,994
Oilseed crush	6,024	6,929	7,988	12,224
Feedstock delivery by barge	1,152	1,415	1,722	2,952
Feedstock delivery by rail	365	450	550	947
Biodiesel processing, with feedstock collection	17,120	18,427	19,955	26,068
Rail deliveries of domestic biodiesel	1,372	1,401	1,435	1,571
Rail deliveries of glycerin	326	387	457	739
Rail deliveries of imported biodiesel	19	20	21	27
Rail deliveries of exported biodiesel	219	244	274	392
Trucking domestic biodiesel to sale	1,203	1,304	1,423	1,899
Trucking imports to sale	212	216	220	237
Import port activities	190	216	247	370
Export port activities	21	22	23	26

Table 7: Jobs supported by the United States biodiesel sector (assuming 100% U.S. domestic production and zero imports)

	Actual 2021 Supply, but 100% US	Supply scenarios (100%/0% US/import split)		
US supply (billion gallons)	**3.1**	**3.5**	**4.0**	**6.0**
- U.S. production	*3.1*	*3.5*	*4.0*	*6.0*
- Imports	*0.0*	*0.0*	*0.0*	*0.0*
Employment impact (FTE jobs)	93,755	107,373	123,299	187,003
Oilseed production	35,277	40,329	46,237	69,869
Animal processing and waste grease delivery	20,350	24,432	29,205	48,299
Local oilseed delivery	1,586	1,884	2,233	3,629
Elevation	3,937	4,678	5,545	9,011
Oilseed crush	7,590	8,713	10,027	15,282
Feedstock delivery by barge	1,607	1,933	2,314	3,840
Feedstock delivery by rail	512	618	741	1,234
Biodiesel processing, with feedstock collection	19,380	21,001	22,897	30,481
Rail deliveries of domestic biodiesel	1,422	1,458	1,500	1,668
Rail deliveries of glycerin	431	505	593	942
Rail deliveries of imported biodiesel	0	0	0	0
Rail deliveries of exported biodiesel	263	294	331	478
Trucking domestic biodiesel to sale	1,378	1,504	1,652	2,242
Trucking imports to sale	0	0	0	0
Import port activities	0	0	0	0
Export port activities	22	23	24	28

Table 8: Wages supported by the United States biodiesel sector (using actual 2021 supply composition of 80% U.S. domestic production and 20% imports)

	Actual 2021 Supply	Supply scenarios (80%/20% US/import split)		
US supply (billion gallons)	**3.1**	**3.5**	**4.0**	**6.0**
- U.S. production	*2.5*	*2.8*	*3.2*	*4.8*
- Imports	*0.6*	*0.7*	*0.8*	*1.2*
Wage impact (billion U.S. dollars)	3.59	4.10	4.69	7.08
Oilseed production	1.36	1.55	1.78	2.70
Animal processing and waste grease delivery	0.56	0.68	0.83	1.42
Local oilseed delivery	0.06	0.07	0.08	0.14
Elevation	0.15	0.18	0.22	0.36
Oilseed crush	0.38	0.43	0.50	0.76
Feedstock delivery by barge	0.03	0.04	0.05	0.08
Feedstock delivery by rail	0.02	0.02	0.02	0.04
Biodiesel processing, with feedstock collection	0.88	0.95	1.03	1.34
Rail deliveries of domestic biodiesel	0.04	0.04	0.04	0.05
Rail deliveries of glycerin	0.01	0.02	0.02	0.03
Rail deliveries of imported biodiesel	0.00	0.00	0.00	0.00
Rail deliveries of exported biodiesel	0.01	0.01	0.01	0.02
Trucking domestic biodiesel to sale	0.07	0.07	0.08	0.11
Trucking imports to sale	0.01	0.01	0.01	0.01
Import port activities	0.01	0.01	0.01	0.02
Export port activities	0.00	0.00	0.00	0.00

Table 9: Wages supported by the United States biodiesel sector (assuming 100% U.S. domestic production and zero imports)

	Actual 2021 Supply, but 100% US	Supply scenarios (100%/0% US/import split)		
US supply (billion gallons)	**3.1**	**3.5**	**4.0**	**6.0**
- U.S. production	*3.1*	*3.5*	*4.0*	*6.0*
- Imports	*0.0*	*0.0*	*0.0*	*0.0*
Wage impact (billion U.S. dollars)	4.45	5.08	5.82	8.77
Oilseed production	1.70	1.94	2.22	3.36
Animal processing and waste grease delivery	0.78	0.93	1.11	1.84
Local oilseed delivery	0.08	0.09	0.11	0.18
Elevation	0.21	0.24	0.29	0.47
Oilseed crush	0.47	0.54	0.63	0.96
Feedstock delivery by barge	0.04	0.05	0.06	0.11
Feedstock delivery by rail	0.02	0.03	0.03	0.05
Biodiesel processing, with feedstock collection	1.00	1.08	1.18	1.57
Rail deliveries of domestic biodiesel	0.04	0.04	0.04	0.05
Rail deliveries of glycerin	0.02	0.02	0.02	0.04
Rail deliveries of imported biodiesel	0.00	0.00	0.00	0.00
Rail deliveries of exported biodiesel	0.01	0.01	0.01	0.02
Trucking domestic biodiesel to sale	0.08	0.09	0.09	0.13
Trucking imports to sale	0.00	0.00	0.00	0.00
Import port activities	0.00	0.00	0.00	0.00
Export port activities	0.00	0.00	0.00	0.00

Temporary economic impacts

We estimate biodiesel capacity at registered facilities in the United States at the end of 2021 at 4.6 billion gallons, producing 2.5 billion gallons of FAME and RD. This LMC capacity estimate is higher than that of the EIA because we include non-operational facilities, both for FAME plants that are idle and for newly constructed RD plants yet to come on-stream. This LMC estimate therefore includes all facilities that could potentially produce biodiesel currently. This implies a utilization rate of less than 55% at the end of 2021, but as demand rises, so will utilization rates. We judge 80% capacity utilization to be a realistic longer-term rate (this would bring the United States in line with the EU biodiesel sector). Therefore, to accommodate increased domestic production of 6.0 billion gallons will require 7.5 billion gallons of capacity — an additional 2.8 million gallons of capacity will have to be installed (using EIA capacity estimates would make this figure even higher). We have assumed greenfield construction, especially in view of the number of impending greenfield projects for renewable diesel, but we note that industry expansion can, and probably will, occur through individual plant expansions as well.

Table 10: U.S. biodiesel capacity utilization and temporary economic impacts associated with new capacity construction

Production (billion gallons)	**4.0**	**6.0**
Total Capacity	5.00	7.50
Capacity Utilization	80%	80%
Additional Capacity Built	0.36	2.86
Total Temp Construction Job-Years Created	61,400	144,500
Total Temp Construction Wages Created (billions)	2.5	5.8
Total Revenues (billions)	0.5	4.3

- This would create as many as 144,500 temporary job years (i.e. with two years to build an average plant, this implies 77,250 FTE jobs lasting two years each), $5.8 billion in temporary wages paid, and $4.3 billion in temporary economic activity.

Sustainable aviation fuel (SAF)

To date, only small amounts of SAF have been produced in United States, which are included in our RD analysis. The scale of future SAF production is a major consideration for the United States biodiesel sector, as this could help grow the overall market — and thus revenues and potentially jobs and wages — significantly.

Norway became the first country in the world to introduce an SAF mandate, in 2020. As with any sector which depends on policy support and technology developments, there is considerable uncertainty over the outlook for SAF, but strong support from governments, the aviation industry and the fuel sector could see it realize substantial growth in the near and long term.

SAF has grown in prominence as a solution to the challenge of ‘greening’ the aviation industry, in part due to lack of alternatives as flight electrification is unlikely to prove an effective solution for large passenger and freight aircraft.

SAF, meanwhile, enjoys many benefits. As an outgrowth of the rapidly expanding renewable diesel industry, it benefits from established technological and industrial expertise. SAF is also, unlike most traditional biofuels, usually a ‘drop-in’ fuel, meaning it has sufficient chemical similarity to fossil jet fuel to be blended in high quantities.

Particularly after 2030, it is expected that growth in the supply needed to meet this demand will come primarily from new technologies using alternative feedstocks such as biomass and CO_2 capture. Limits on the supply of waste oils and fats — already under considerable demand pressure — will mean they are likely to constitute a minority of future SAF feedstock supply.

There is a great amount of uncertainty surrounding SAF forecasts, given that they depend on (1) the successful deployment of new technologies and (2) strong policy support to effectively create and sustain the market. Because of their price premium over conventional fuels, mandated consumption is the main driver of the market for SAF: while government support is currently strong, the events of the past couple of years have reminded us that unforeseen setbacks can quickly change policy priorities. However, biodiesel has been through periods of greater and lesser policy support, but a couple of decades on from its inception it now forms an accepted, still-expanding component of the energy mix in many major countries.