



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*



## Biodiesel Prices and Profits...Again

Scott Irwin

Department of Agricultural and Consumer Economics  
University of Illinois

March 11, 2024

*farmdoc daily* (14): 49

---

Recommended citation format: Irwin, S. "Biodiesel Prices and Profits...Again." *farmdoc daily* (14): 49, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, March 11, 2024.

Permalink: <https://farmdocdaily.illinois.edu/2024/03/biodiesel-prices-and-profits-again.html>

---

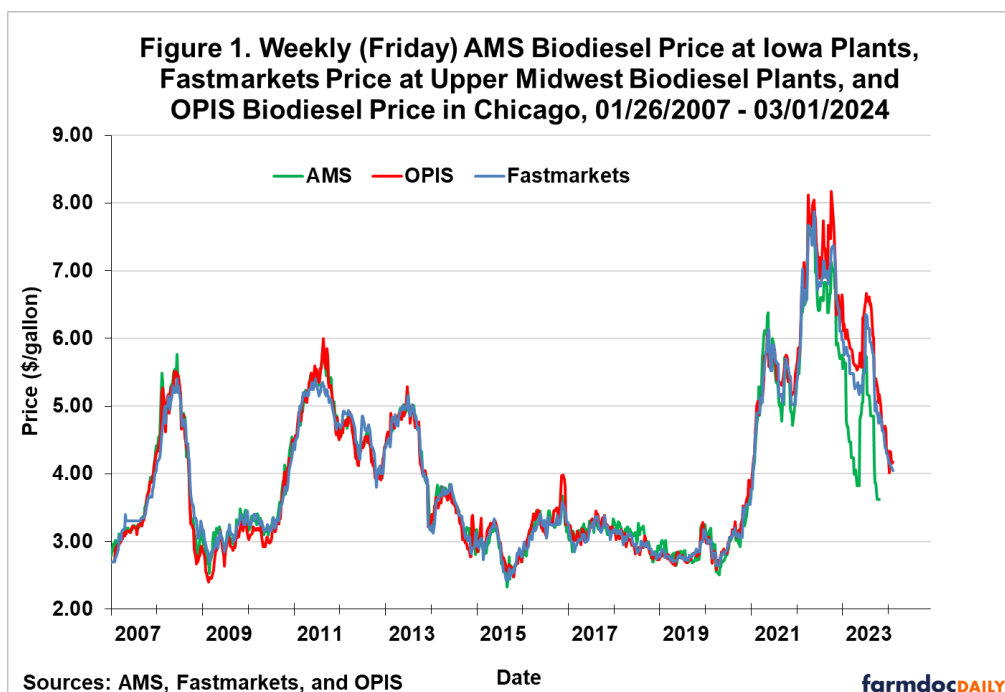
In a previous *farmdoc daily* article ([November 13, 2023](#)), we showed that the behavior of FAME biodiesel prices reported by the Agricultural Marketing Service (AMS) of the USDA changed dramatically starting in August 2021. Before this date, the AMS price and an industry benchmark price provided by OPIS differed, on average, by only a few cents and were extremely highly correlated. Beginning in August 2021, AMS prices began to lag far behind OPIS prices, with the difference reaching over \$1.50 per gallon at times. Substituting OPIS prices for the AMS prices flipped the average biodiesel profitability estimate for the renewable diesel boom years (2021-2023) from strongly negative to positive. However, the use of OPIS biodiesel prices in the analysis may be problematic because the OPIS prices represent wholesale transactions in Chicago rather than at Iowa biodiesel plants. In addition, recent reports of planned shutdowns of FAME biodiesel plants (Kotrba, 2024a,b) due to "poor market conditions" indicates that profitability may not have been as strong as suggested in the [November 13<sup>th</sup> article](#). The purpose of today's article is to investigate the profitability of FAME biodiesel production using a plant price collected by Fastmarkets, another price reporting service. We also consider adjustments to production costs for biodiesel plants to represent changes more accurately through time. This is the 17th in a series of *farmdoc daily* articles on the renewable diesel boom (see the complete list of articles [here](#)).

### Analysis

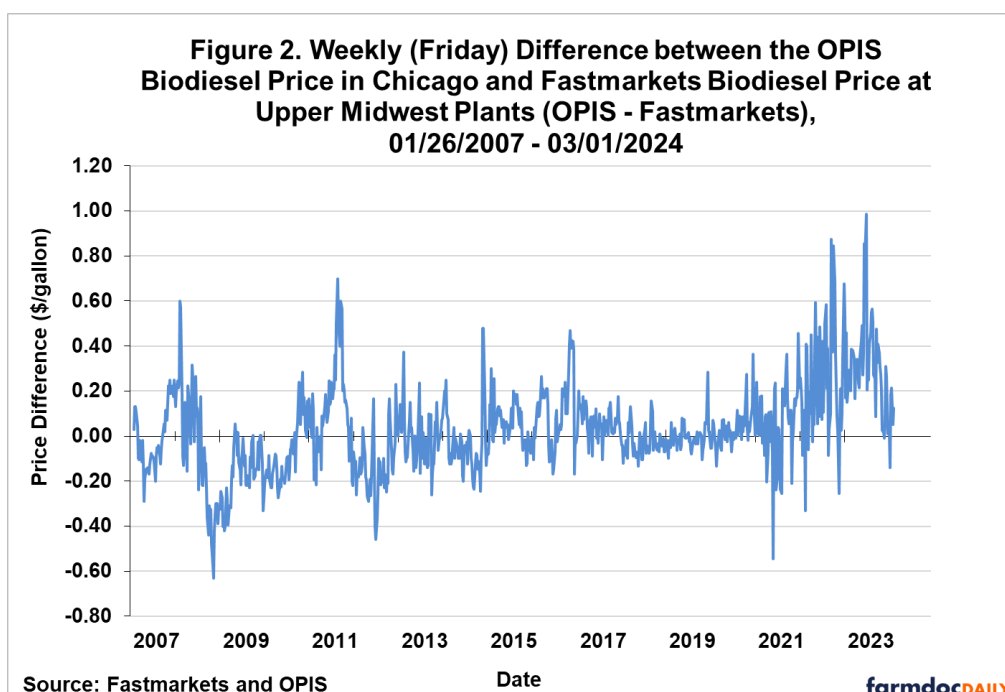
We begin the analysis by comparing weekly prices from AMS, OPIS, and Fastmarkets over January 26, 2007 through March 1, 2024. The AMS prices are reported in the [National Weekly Ag Energy Roundup](#) and represent FOB prices at Iowa ethanol plants through July 22, 2022 and both Iowa and Minnesota plants thereafter. The AMS price series has not been reported since December 8, 2023. As noted in the introduction, the OPIS price represents FOB wholesale transactions in Chicago. The Fastmarkets (formerly Jacobsens) price is FOB at Upper Midwest biodiesel plants. Eight states are included in the Upper Midwest region by Fastmarkets: Iowa, Illinois, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin. Nearly half the FAME biodiesel plants found in this eight-state region are located in Iowa (*farmdoc daily*, [February 22, 2023](#)). Figure 1 shows that the three FAME biodiesel price series track each other very closely through 2020. After 2020 there is a clear and unmistakable change in the behavior of AMS biodiesel prices relative to the OPIS and Fastmarkets prices, with AMS reported prices much lower. This tendency towards lower AMS prices became especially pronounced during 2023.

---

We request all readers, electronic media and others follow our citation guidelines when re-posting articles from *farmdoc daily*. Guidelines are available [here](#). The *farmdoc daily* website falls under University of Illinois copyright and intellectual property rights. For a detailed statement, please see the University of Illinois Copyright Information and Policies [here](#).



We focus next on the relative behavior of the OPIS and Fastmarkets prices, as these are the main alternatives to the AMS biodiesel price series. The difference between the weekly OPIS and Fastmarkets biodiesel prices (OPIS - Fastmarkets) over January 26, 2007 through March 1, 2024 is shown in Figure 2. The difference varies widely over time but averages very close to zero from 2007 through 2020. However, the behavior changes noticeably in the renewable diesel boom years of 2021-2024, when the difference averaged \$0.20 per gallon and reached as high as \$1. A positive difference (OPIS > Fastmarkets) is logical in the sense that the price difference should reflect the cost of transporting biodiesel from plants to Chicago. Notice that the price difference has returned to much smaller levels in recent months. If there is a surprise in the results it is the fact that the difference averaged very close to zero before 2021, which would indicate limited compensation for transporting biodiesel from Midwest plants to Chicago.



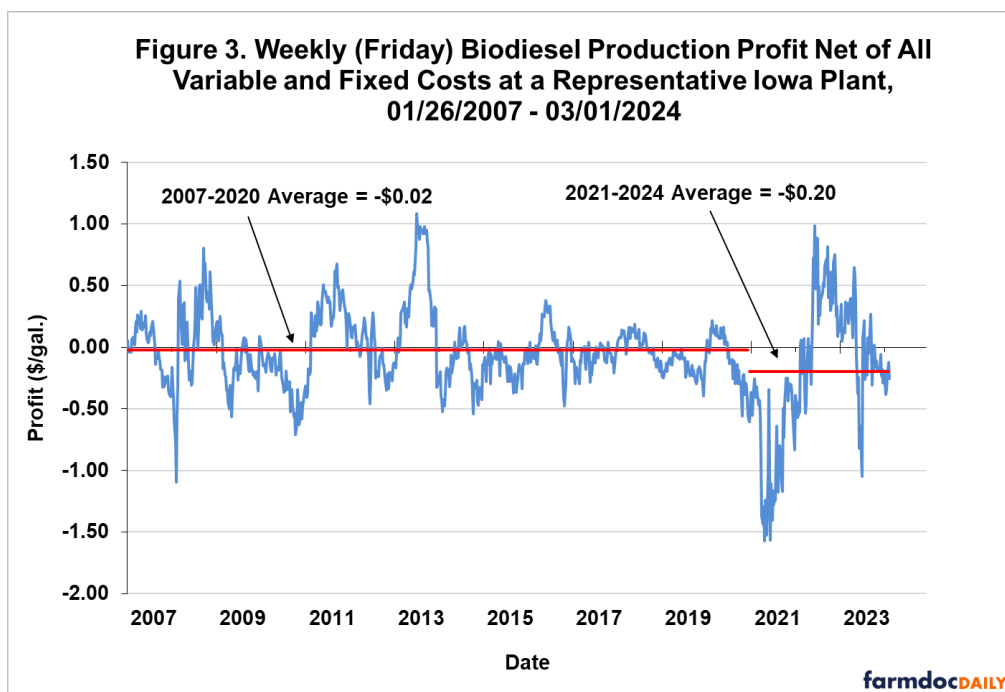
At this point, it is clear that the behavior of OPIS and Fastmarkets biodiesel prices is similar except for 2021 through 2023, which is the heart of the renewable diesel boom. Nonetheless, in the biodiesel profitability analysis that follows we will use the Fastmarkets price to represent biodiesel prices at Iowa ethanol plants because: i) it is directly based on biodiesel FOB plant prices in a region that includes heavy representation of Iowa biodiesel plants, and ii) it reflects plant level prices during the volatile renewable diesel boom years.

To assess production profits, we will use a modified version of the model of a representative Iowa biodiesel plant that has been used in a number of previous *farmdoc daily* articles (e.g., [February 16, 2022](#); [May 10, 2023](#); [November 13, 2023](#)). This model is meant to be representative of an “average” plant constructed in 2007 to process soybean oil into biodiesel. There is certainly substantial variation in capacity, production efficiency, and feedstock across the industry and this should be kept in mind when viewing profit estimates from the model.

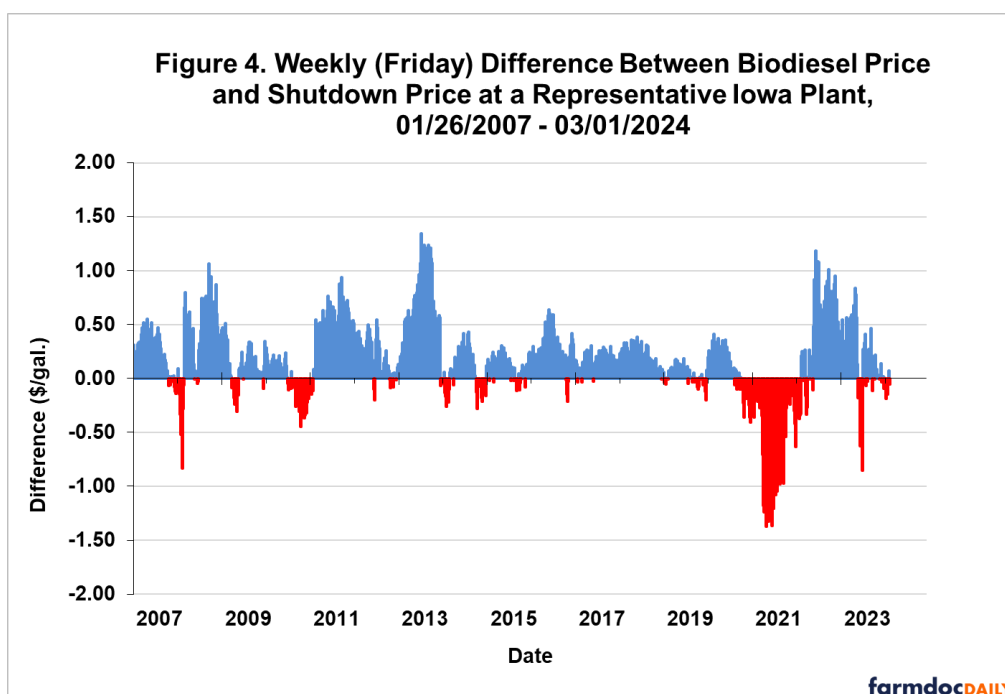
In addition to using the Fastmarkets series to represent FAME biodiesel prices at an Iowa plant, we make three other changes to the assumptions of the model. First, marketing fees for biodiesel and glycerin are indexed to inflation using the U.S. Consumer Price Index (CPI) for all cities and consumers. This results in the marketing fee for biodiesel rising from \$0.10 per gallon in 2007 to \$0.15 in 2023. The glycerin marketing fee is small enough, around a penny, that the adjustment has little impact. Second, non-soybean oil/non-natural gas variable costs are also indexed to the CPI, which results in this category of costs rising from \$0.25 per gallon in 2007 to \$0.37 in 2023. Third, a transportation charge is added to soybean oil prices to reflect the cost of transporting soybean oil by rail from a crush facility to the representative Iowa biodiesel plant. This charge is assumed to be \$0.01 per pound of soybean oil in 2007 and then indexed to the [USDA's Grain Rail Shipping Cost Index](#) in following years. This results in the transportation charge rising from \$0.010 per pound in 2007 to \$0.016 in 2023. For perspective, if soybean oil is shipped 150 miles to a biodiesel plant, the rail cost will range between \$0.13 and \$0.22 per ton-mile.

Revised biodiesel production profit estimates net of all variable and fixed costs over January 26, 2007 through March 1, 2024 are presented in Figure 3. The average profit over 2007 through 2020 is now estimated to be -\$0.02 per gallon compared to +\$0.07 in the [November 13<sup>th</sup> farmdoc daily article](#). The lower average profit is due to the higher costs outlined above. During the renewable diesel boom years of 2021 through 2024 the estimated profit varies hugely, from a loss of roughly -\$1.50 to a profit of +\$1.00 and averaged a loss -\$0.20 per gallon. By comparison, average profit was estimated in the November 13<sup>th</sup> farmdoc daily article to be +\$0.60 per gallon, mainly reflecting the impact of using Chicago OPIS prices that were higher than Fastmarkets plant prices in recent years.

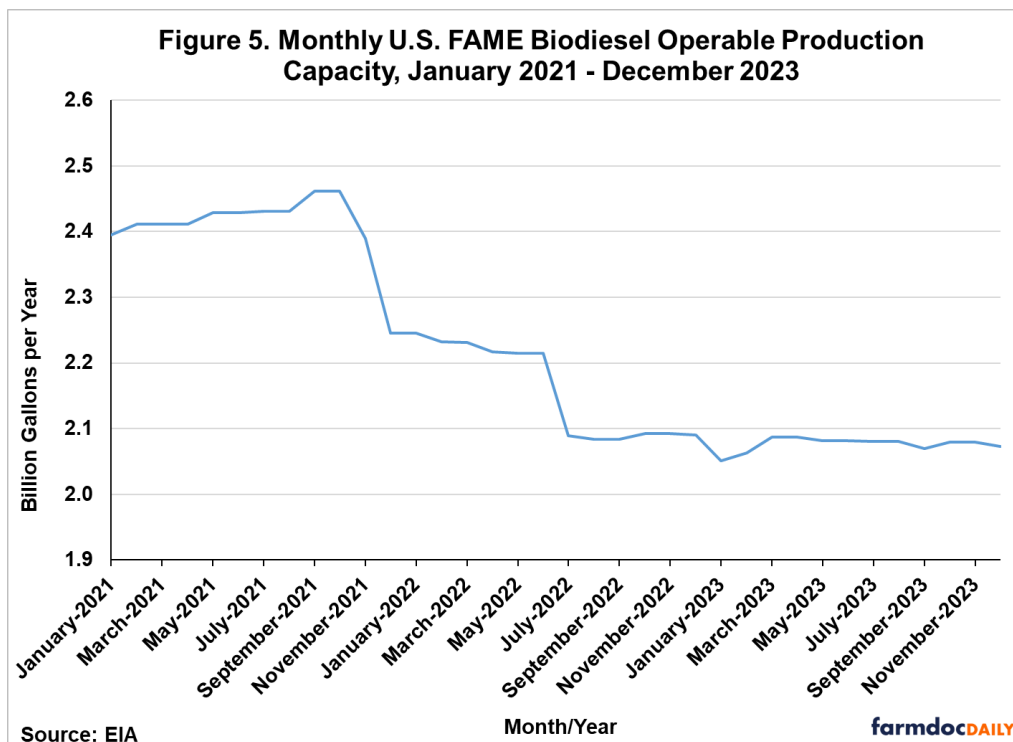
The new profit estimates indicate that FAME biodiesel production profits have been on a severe roller coaster during the renewable diesel boom. During the early phase of the boom from January 2021 through May 2022, soybean oil prices skyrocketed, and biodiesel prices struggled to keep up, resulting in losses that averaged an astounding -\$0.59 per gallon. Then, in the middle phase of the boom from June 2022 and May 2023, biodiesel prices recovered, propelling profits to a historically very high average level of +\$0.41 per gallon. Since then, conditions have softened and the average loss over June 2023 through March 2024 (to date) was -\$0.19 per gallon. As noted earlier, the net result of this rollercoaster was an average loss of -\$0.20 per gallon for biodiesel producers so far in the renewable diesel boom.



The implication of the rollercoaster for biodiesel plants is illustrated in a different manner in Figure 4, which presents the difference between weekly FAME biodiesel prices at the representative Iowa plant and a computed shutdown price. We define the shutdown price to be the biodiesel price net of marketing costs equal to the variable cost of production net of glycerin revenue. This is based on the classical economic theory of the firm, which predicts that production should cease if price does not cover average variable cost. In the chart, positive blue bars indicate the biodiesel price is above the shutdown price. Likewise, negative red bars indicate the biodiesel price is below the shutdown price. The massive losses during the early phase of the renewable diesel boom clearly signaled that at least some capacity should be shuttered. This signal was then reversed for the remainder of 2022 and the first half of 2023. Shutdown signals have been mixed negative since June 2023, but mainly negative during 2024 to date.



The shutdown signals presented in Figure 4 are mirrored in the available data from the Energy Information Agency (EIA) of the Department of Energy on the “operable” capacity of FAME biodiesel plants. Figure 5 shows the EIA estimates of FAME biodiesel operable capacity for January 2021 through December 2023. Operable capacity entered the period near 2.4 billion gallons, then in the face of huge losses, fell sharply from a high of 2.461 billion gallons in September 2021 to 2.089 billion gallons in July 2022. This decline in capacity of 372 million gallons represented 15 percent of total industry capacity. Reflecting the return to better profitability, operable capacity stabilized at just under 2.1 billion gallons after July 2022. The recent announcements of biodiesel plant shutdowns (Kotrba, 2024a,b) indicate that production losses may be large enough in 2024 to trigger another round of plant shutdowns.



## Implications

The renewable diesel boom in the U.S. has raised a host of interesting questions about the biofuels sector. A particularly important one is the impact of the boom on FAME biodiesel prices and profits. We have long used biodiesel prices from the Agricultural Marketing Service (AMS) of the USDA to compute biodiesel production profits, but the behavior of the series changed dramatically starting in August 2021. In this article, we estimate the profitability of FAME biodiesel production using a plant price collected by Fastmarkets and consider adjustments to production costs for biodiesel plants to represent changes more accurately through time. The new profit estimates indicate that FAME biodiesel production profits have been on a severe roller coaster during the renewable diesel boom years of 2021-2024, averaging an astounding loss of  $-\$0.59$  per gallon during the early part of the boom, recovering to a historically high average level of  $+\$0.41$  per gallon in the middle, and back to losses that averaged  $-\$0.19$  per gallon since mid-2023. The average loss for biodiesel producers during this rollercoaster was  $-\$0.20$  per gallon. Changes in the operable capacity of FAME biodiesel plants mirror the pattern of profits and losses, with a sharp drop in capacity following the large losses of 2021 and early 2022. If the losses in 2024 to date continue, more biodiesel plant shutdowns may be in the offing.

## References

Gerverni, M., T. Hubbs and S. Irwin. "The Biodiesel Profitability Squeeze." *farmdoc daily* (13):85, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, May 10, 2023.

Gerveni, M., T. Hubbs and S. Irwin. "Overview of the Production Capacity of U.S. Biodiesel Plants." *farmdoc daily* (13):32, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, February 22, 2023.

Irwin, S. "The Biodiesel Profitability Squeeze that Wasn't." *farmdoc daily* (13):207, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, November 13, 2023.

Irwin, S. "2021 Was a Devastating Year for Biodiesel Production Profits." *farmdoc daily* (12):21, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, February 16, 2022.

Kotrba, R. "Chevron REG to Close Biodiesel Plant in DeForest, Wisconsin." *Biobased Diesel Daily*, March 1, 2024a. <https://www.biobased-diesel.com/post/chevron-reg-to-close-biodiesel-plant-in-deforest-wisconsin>

Kotrba, R. "Chevron REG to Close Ralston, Iowa Biodiesel Production Facility." *Biobased Diesel Daily*, March 1, 2024b. <https://www.biobased-diesel.com/post/chevron-reg-to-close-ralston-iowa-biodiesel-production-facility>