A fiscal incentive program to produce sustainable aviation fuel from used cooking oil in Indonesia

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INTRODUCTION

Indonesia's biofuel program, implemented under Ministry of Energy and Mineral Resources Regulation No. 4/2025, requires fuel producers to blend biodiesel, bioethanol, and bio-jet fuel into the fuel supply. The biodiesel blend mandate was first set at 2.5% in 2008 and increased to 35% in 2023.[1] To support the production of biodiesel, the government established the *Badan Pengelola Dana Perkebunan Kelapa Sawit* (Palm Oil Estate Fund, POEF), which collects service fees from exported palm products that are then used to subsidize production of crude palm oil (CPO) biodiesel.[2] Programs to support bioethanol and bio-jet fuel production, meanwhile, have not been widely implemented.

In 2023, Indonesia tested a commercial flight using a blend of 2.4% sustainable aviation fuel (SAF) produced with palm oil and co-processed with fossil jet fuel in Pertamina's Cilacap Green Refinery.[3] SAF could be produced through co-processing at existing refineries with minor modifications, with renewable feedstock replacing up to 5% of fossil feedstock.[4] A different production pathway involves converting existing fossil

1 Arif Rahmanulloh, "Indonesia to Implement Biodiesel B35 in February 2023" (Foreign Agriculture Service, U.S. Department of Agriculture, January 11, 2023), https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Indonesia%20to%20Implement%20Biodiesel%20B35%20in%20February%202023_Jakarta_Indonesia_ID2023-0001.pdf.

2 Tenny Kristiana et al., *Producing High-Quality Biodiesel from Used Cooking Oil in Indonesia*, (International Council on Clean Transportation, 2023), https://theicct.org/publication/producing-high-quality-biodiesel-from-used-cooking-oil-in-indonesia-aug23/.

3 Tom Lutzy, "Indonesia Conducts Its First SAF-powered Commercial Flight," *Airways*, February 11, 2023, https://www.airwaysmag.com/legacy-posts/indonesias-first-saf-powered-commercial-flight.

4 Topsoe, "Fast-Track Your Renewable Journey with Co-Processing," accessed May 23, 2025, https://www.topsoe.com/hubfs/DOWNLOADS/DOWNLOADS%20-%20Brochures/20124%20Renewable%20feedstock_WEB.pdf. This standard of blending is based on ASTM D1655 Annex A1 co-hydroprocessing of esters and fatty acids and Fischer-Tropsch hydrocarbons in a conventional petroleum refinery. International Air Transport Association, *SAF Handbook* (May 2024), https://www.iata.org/en/programs/sustainability/reports/saf-handbook/saf-handbook-table-of-content/.

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fuel refineries or building new facilities to process 100% renewable lipid feedstocks to produce hydroprocessed esters and fatty acids (HEFA) fuels that can be blended up to 50% with fossil jet fuel.[5] A previous ICCT study showed that HEFA made from used cooking oil (UCO) has the lowest levelized production costs across SAF pathways, making this an attractive option in the near term.[6]

Stakeholders in Indonesia are currently discussing whether other feedstocks could be incorporated into the national biofuel program, especially for producing SAF.[7] Waste oils, including UCO, are feedstocks that are associated with low greenhouse gas emissions and could be used to produce SAF via hydroprocessing.[8] A previous ICCT analysis found that 715,000 tonnes of UCO could be collected from urban households, restaurants, and the food processing industry in Indonesia.[9]

In this brief, we examine how the Indonesian government could support and regulate UCO collection for its SAF program. We summarize best practices from other Asian countries for regulating UCO collection and cite examples of how these countries use UCO in biodiesel production. At present, UCO is more commonly used for biodiesel production than for SAF production in Asia, but experiences of how to best collect and incentivize UCO for biodiesel production can apply to SAF production as well. We also consider a scheme for Indonesia to collect a UCO export levy similar to the one used for palm exports, which could be used to stimulate domestic SAF production from UCO.

USED COOKING OIL COLLECTION PRACTICES

In Indonesia, UCO is considered waste but is not subject to clear regulations regarding collection.[10] The government of Jakarta is one of the few local governments with a program to facilitate UCO collection, which is mostly performed by private third parties.[11] A study by Traction Energy Asia found that UCO is collected by waste management, charity, and trade companies to produce commodities like biodiesel, soap, and candles or is exported to other countries and regions such as the European Union.[12] The Traction study proposed an alternative collection model whereby petrol stations could serve as collection points from which UCO could be transported to a biodiesel plant or SAF production facility. Traction targeted this recommendation toward the central government, given that PT Pertamina, the state-owned oil company, owns the majority of petrol stations across Indonesia.

5 U.S Energy Information Administration, "New Biofuels Eliminate Need for Blending with Petroleum Fuels," *Today in Energy*, November 9, 2015, https://www.eia.gov/todayinenergy/detail.php?id=23692#:~:text=HEFA%20fuels%20are%20produced%20by%20reacting%20vegetable,reduce%20diesel%20sulfur%20levels%20in%20petroleum%20refineries.

6 Nikita Pavlenko et al., *The Cost of Supporting Alternative Jet Fuels in the European Union* (International Council on Clean Transportation, 2019), https://theicct.org/publication/the-cost-of-supporting-alternative-jet-fuels-in-the-european-union/.

7 Haryanti Puspa Sari and Erlangga Djumena, "Luhut: Indonesia Akan Bangun Industri Minyak Jelantah Pengganti Avtur" [Luhut: Indonesia Will Build Used Cooking Oil Industry to Replace Avtur], *Kompas.com*, May 29, 2024, https://money.kompas.com/read/2024/05/29/163600326/luhut--indonesia-akan-bangun-industri-minyak-jelantah-pengganti-avtur.

8 Yuanrong Zhou et al., *Opportunities for Waste Fats and Oils as Feedstocks for Biodiesel and Renewable Diesel in Indonesia* (International Council on Clean Transportation, 2021), https://theicct.org/publication/opportunities-for-waste-fats-and-oils-as-feedstocks-for-biodiesel-and-renewable-diesel-in-indonesia/.

9 Tenny Kristiana et al., *An Estimate of Current Collection and Potential Collection of Used Cooking Oil from Major Asian Exporting Countries* (International Council on Clean Transportation, 2022), https://theicct.org/publication/asia-fuels-waste-oil-estimates-feb22/.

10 Teddy Prasetiawan, *Pemanfaatan Jelantah di Tengah Carut Marut Tata Kelola Minyak Goreng* [Utilization of Used Coooking Oil Amid the Chaos of Cooking Oil Management] (Pusat Penelitian Badan Keahlian DPR RI, 2009), retrieved from https://berkas.dpr.go.id/pusaka/files/info_singkat/Info%20Singkat-XIV-9-I-P3DI-Mei-2022-223.pdf.

11 Sudaryadi et al., *Used Cooking Oil (UCO) Collection Model for Biodiesel Feedstock in Indonesia* (Traction Energy Asia, 2021).

12 Sudaryadi et al., *Used Cooking Oil (UCO) Collection Model.*

Several other Asian countries have policies in place to collect UCO, and some are already using the feedstock in their biofuel policies. In China and Japan, UCO collection for biofuel production is not directly linked to a government-mandated biofuel blending program. China's central government has several regulations in place related to UCO, including the Emergency Notifications of Preventing Entry of Waste Cooking Oil Entering Food & Beverage Services.[13] However, UCO collection in China relies heavily on local governments, each of which takes a different approach. For example, in Suzhou, UCO is collected by biodiesel producers, while in Nanjing, third parties do the collection and sell it to biodiesel enterprises.[14]

In Japan, UCO is regulated under the Law for Promotion of Effective Utilization of Resources and the Food Waste Recycling Law, which govern recycling generally and food waste recycling specifically, and its collection is promoted under the Biomass Town project, which aims to promote the use of biomass.[15] The government has a strict collection scheme that includes penalties for businesses that sell UCO illegally.[16] Although there is not a specific mandate for biofuel blending, UCO is a primary feedstock for domestic biodiesel production.[17] Further, the Japanese Ministry of Economy, Trade, and Industry includes UCO as an approved feedstock for producing SAF in the context of Japan's goal of replacing 10% of jet fuel with SAF by 2030.[18]

The Republic of Korea has implemented a biodiesel blending mandate, and UCO has become one of the main feedstocks for biodiesel production in the country.[19] Currently, the biodiesel blending mandate is 4%, which the Korean Ministry of Trade, Industry, and Energy plans to increase to 8% by 2030.[20] The Korean government categorizes UCO as a recyclable source that must be collected by authorized local recyclers, and the feedstock is then sold to biodiesel producers.[21]

India's biofuel policy lists UCO as a feedstock to support a 5% biodiesel blending mandate by 2030, and the country has regulations in place to enforce UCO collection.[22] The Repurpose Used Cooking Oil program was established under the Food Safety and Standards Authority of India to mandate the collection of UCO for use in biodiesel.[23] The collection guidelines state that food businesses that consume more than 50 liters of cooking oil per day are required to record and dispose of the UCO through an authorized collection agency, which then provides the UCO to biodiesel producers.[24]

13 Huiming Zhang et al., "Waste Cooking Oil as an Energy Resource: Review of Chinese Policies," *Renewable and Sustainable Energy Reviews* 16 (2012): 5225–5231, http://dx.doi.org/10.1016/j.rser.2012.05.008.

14 Huiming Zhang et al., "How to Increase the Recovery Rate for Waste Cooking Oil-to-Biofuel Conversion: A Comparison of Recycling Modes in China and Japan," *Ecological Indicators* 51 (2015): 146–150, https://doi.org/10.1016/j.ecolind.2014.07.045.

15 Zhang et al., "Recovery Rate"; Masafuni Tateda et al., "Research Article: Preparation for Establishing Environmentally and Socially Friendly Business in Biomass Town of Imizu City, Toyama, Japan: A Case Study of the Waste Vegetable Oil-Recycling Business," *Environmental Practice* 13, no. 2 (2011): 143–154, https://doi.org/10.1017/S146604661100010X.

16 Zhang et al., "Recovery Rate."

17 Daisuke Sasatani, *Japan: Biofuels Annual* (United States Department of Agriculture, Foreign Agricultural Service, 2022), https://fas.usda.gov/data/japan-biofuels-annual-6.

18 Sasatani, *2023 Biofuels Annual*.

19 Jung-Yull Shin et al., "A Comparison Study on the RFS program of Korea with the US and UK," *Sustainability* 10, no. 12, 4618 (2018): 1–20, https://doi.org/10.3390/su10124618.

20 Shin et al., "Comparison Study."

21 Sangmin Cho et al., "Incentives for Waste Cooking Oil Collection in South Korea: A Contingent Valuation Approach," *Resources, Conservation and Recycling* 99 (2015): 63–71, https://doi.org/10.1016/j.resconrec.2015.04.003.

22 Shilpita Das and Mark Rosmann, *India: Biofuels Annual* (United States Department of Agriculture, Foreign Agricultural Service, 2023), https://fas.usda.gov/data/india-biofuels-annual-8.

23 "About RUCO," Food Safety and Standards Authority of India, accessed in January, 29, 2024, retrieved from https://eatrightindia.gov.in/ruco/index.php.

24 Food Safety and Standards Authority of India, *Guidelines for Collection of Used Cooking Oil (UCO) by Biodiesel Manufacturers From Food Business Operators Through Their Authorized Collection Agencies* (2019), https://eatrightindia.gov.in/ruco/guidelines_for_collection.php.

India has high potential for UCO collection, but a lack of stakeholder communication has been cited as a factor in the slow increase in UCO collection under the program.[25]

We summarize these UCO collection practices in Table 1.

Table 1

Summary of used cooking oil collection practices in surveyed countries

Countries	UCO collection regulation	UCO collection incentive	Centralized / decentralized implementation	National UCO biofuel program
Indonesia	No	No	Decentralized	No
China	Yes	Yes	Decentralized	No
India	Yes	No	Centralized	Yes
Japan	Yes	Yes	Decentralized	No
Republic of Korea	Yes	No	Centralized	Yes

FISCAL INCENTIVE SCHEME TO SUPPORT AVIATION FUEL PRODUCED FROM UCO

The main objective of the POEF is to support palm oil development and provide biodiesel price incentives funded by the collection of export levies from palm oil products.[26] Prior to the establishment of the POEF, palm products were only subject to an export fee; exporters are now required to pay both an export fee and a POEF service fee.[27] Since 2022, the POEF also has levied a service fee on UCO and collected revenue from UCO exports. In this section, we illustrate how the government could establish a Used Cooking Oil Fund (UCOF), either as an independent agency or a division under the POEF, to support UCO collection and increase UCO HEFA fuel production in the Indonesian SAF program. Service fees on UCO exports could be used to fund a UCOF program to provide incentives for biofuel production.

We consider three hypothetical options for the structure of UCOF service fees to support UCO-based SAF, summarized in Table 2 and explained in greater detail in the paragraphs that follow. This analysis does not consider the export fee, which is generally collected by the Ministry of Finance, as such funds are not used to support the POEF, so we assume they would not be used for the UCOF.

25 Pahle India Foundation, *Research Paper on Used Cooking Oil (UCO) Based Biodiesel* (2022), https://pahleindia.org/wp-content/uploads/2022/12/UsedCookingOilBasedBiodiesel.pdf; Varsha Somaraj, "FSSAI Initiative Shows Uptick in Used Cooking Oil Collection in Kerala," *The New Indian Express*, September 24, 2024, https://www.newindianexpress.com/states/kerala/2024/Sep/25/fssai-initiative-shows-uptick-in-used-cooking-oil-collection-in-kerala.

26 Kristiana et al., *Producing High-Quality Biodiesel*.

27 Warta Bea Cukai, *Bea Keluar dan Pungutan Dana Perkebunan atas Ekspor Kelapa Sawit, CPO dan Produk Turunannya* [Export Duty and Plantation Fund Levy on Exports of Palm Oil, CPO, and Derivative Products] (2015), https://repository.beacukai.go.id/download/2015/09/7690fff0bc431c0467ddce5f5d29ca7f-majalah-wbc-edisi-8-september-web.pdf.

Table 2

Potential structure of Used Cooking Oil Fund service fee on exports, with potential values by UCO price

Tariff categories based on UCO price ($/ton)	Option 1 UCOF flat-rate service fee ($/ton)	Option 2 UCOF service fee ($/ton)	Option 3 UCOF % service fee
< 650	210	100	20%
650–700		110	
700–750		120	
750–800		130	
800–850		140	
850–900		150	
900–950		160	
950–1,000		165	
1,000–1,050		170	
> 1,050		175	

Option 1 entails a flat-rate service fee. Starting in 2022, the Indonesian government applied a flat-rate service fee of $35/ton for UCO. Based on our discussion with policymakers, the flat rate of $35/ton is considered small compared to that applied for crude palm oil-based products, so we assessed a hypothetical fee of $210/ton.[28] The United Arab Emirates (UAE), for context, applies an export tax on UCO of around $109/metric ton; biofuel producers assess that the tax will discourage UCO exports, providing more UCO to support domestic biofuel production.[29]

Option 2 considers a UCOF service fee that mimics the adjustable-rate POEF service fee that the government implemented from 2015 to 2025, which varied based on export prices of CPO and palm derivative products.[30] The Ministry of Trade and Ministry of Finance were responsible for POEF service fee adjustments. A CPO reference price, regularly adjusted by the Ministry of Trade, determined the amount of the export fee and POEF service fee listed under Ministry of Finance regulation. Under that program, the government designated service fee categories based on $50/ton CPO price range increments; as the CPO price increased, so did the service fee. From 2015 to 2023, the POEF was estimated to have collected total service fees of Rp. 187 trillion.[31]

For Option 2, we set minimum and maximum service fee categories based on historic UCO trade prices, which ranged between $630/ton and $1,050/ton from 2018 to

28 Personal communication with the Fiscal Policy Agency, March 19, 2024.

29 Nithin Chandran, "UAE Implements Tax on UCO Exports," *Engine*, February 6, 2024, https://engine.online/news/regulations/uae-implements-tax-on-uco-exports-5772.

30 Arif Rahmanulloh, *Indonesia: Biofuels Annual* (United States Department of Agriculture, Foreign Agricultural Service, 2021), https://fas.usda.gov/data/indonesia-biofuels-annual-5.

31 M Baqir Idrus Alatas, "BPDPKS Kumpulkan Dana Pungutan Sawit Rp186,6 Triliun per Mei 2023," [BPDPKS Collected Rp186.6 Trillion of Palm Oil Levy as of May 2023], *ANTARA*, June 26, 2023, https://www.antaranews.com/berita/3606507/bpdpks-kumpulkan-dana-pungutan-sawit-rp1866-triliun-per-mei-2023.

2023,[32] and assumed the government would adopt a starting UCOF service fee of $100/ton. As in the POEF's adjustable-rate system, we then applied an incremental service fee rate increase for each $50/ton change in UCO price. The service fee increases by $10/ton until the UCO price reaches the government's reference price category, which we assumed to fall between $900/ton and $950/ton based on the average price of UCO in 2023; from this point, the service fee increases by $5/ton.[33] The UCOF reference price value could be updated annually or quarterly, as was done under the POEF.

Finally, Option 3 considers a UCO service fee based on a percentage of the reference market price of exports. This is in line with Regulation No. 30/2025, from May 2025, which instituted a new POEF service fee scheme (including for UCO) based on a percentage of the reference market price of exports.[34] This regulation defines five categories of POEF service fees for palm product exports depending on their type: $0–$25, 10%, 9.5%, 7.5%, and 4.75%; it sets the service fee for CPO at 10% of the reference market price and the service fee for UCO at 9.5%. Option 3 assumes a higher hypothetical rate, of 20%, to provide more funding for UCO SAF.

ESTIMATED USED COOKING OIL FUND INCOME

To estimate how much UCOF income could be generated under the three fee options, we retrieved data on recent volumes of UCO exports from UN Comtrade.[35] Between 2019 and 2023, annual exports of UCO grew steadily, averaging 235,800 tons over the five years and reaching 246,635 tons in 2023.

We then estimated the income that could be earned under five possible service fee structures: a flat $35/ton fee like that previously applied for UCO, a 9.5% fee like that currently applied for UCO, and the three hypothetical options detailed above. In addition to estimating the income based on the 2023 export value (of roughly 247,000 tons), we also considered three alternative scenarios, using the average export value for 2019–2023 as a reference: pessimistic (exports drop to 150,000 tons), moderate (exports at 200,000 tons), and optimistic (exports increase to 300,000 tons). We assumed that the UCOF service fee would not affect export activities due to high demand for UCO in the international market, and that UCO collection improves,

32 Argus Media, *Argus Biofuels: Wednesday 3 May 2023* (May 3, 2023), [link]; Greenea, *Market Watch October 2018* (2018), archived July 21, 2024, at the Wayback Machine, https://web.archive.org/web/20240721053707/https:/www.greenea.com/wp-content/uploads/2018/10/Greenea-Market-Watch-October-2018-1.pdf; Greenea, *Market Watch August 2019* (2019), https://www.greenea.com/wp-content/uploads/2019/08/Greenea-Market-Watch-August-2019-1.pdf; Greenea, *Market Watch October 2019* (2019), https://www.greenea.com/wp-content/uploads/2019/11/Greenea-Market-Watch-October-2019-2-1.pdf; S&P Global, *Biofuelscan Volume 10 / Issue 149* (August 1, 2023), https://www.spglobal.com/commodityinsights/PlattsContent/_assets/_files/en/productsservices/market-reports/biofuelscan-02202020.pdf; Samyak Pandey and Aditya Kondalamahanty, "Global UCO Supply to Double by 2030 as US, EU Policies Drive Asian Supply," *S&P Global*, October 4, 2023, https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/agriculture/100423-global-uco-supply-to-double-by-2030-as-us-eu-policies-drive-asian-supply; Nurul Darni et al., "Asia's UCO Market Poised for Upturn in 2024, UCOME Demand Prospects Uncertain," *S&P Global*, January 2, 2024, https://www.spglobal.com/commodity-insights/en/news-research/latest-news/agriculture/010224-asias-uco-market-poised-for-upturn-in-2024-ucome-demand-prospects-uncertain.

33 In 2023, the average UCO price was $930/ton based on FOB Asia, covering FOB China, FOB Indonesia, FOB North Asia, and FOB Straits. This is based on Argus Media, *Argus Biofuels Issue 23-54* (March 17, 2023), https://view.argusmedia.com/rs/584-BUW-606/images/BIO-Sample-Report-Argus-Biofuels-%282023-03-17%29.pdf; Argus Media, *Argus Biofuels Issue 23-153* (August 8, 2023), https://id.scribd.com/document/672453823/Argus-Biofuels-2023-08-08; Argus Media, *Argus Biofuels Issue 23-205* (October 19, 2023), https://id.scribd.com/document/679198111/Argus-Biofuels-2023-10-19; Darni et al., "Asia's UCO Market"; and Pandey and Kondalamahanty, Global UCO supply."

34 Peraturan Menteri Keuangan Republik Indonesia Nomor 30 Tahun 2025, Tentang Tarif Layanan Badan Layanan Umum Badan Pengelola Dana Perkebunan Pada Kementerian Keuangan [Regulation of the Minister of Finance of the Republic of Indonesia Number 30 of 2025, About the Service Rates of the Plantation Fund Management Agency Public Service Agency at the Ministry of Finance], https://jdih.kemenkeu.go.id/dok/pmk-30-tahun-2025.

35 United Nations Comtrade Database, Indonesia UCO export under HS 151800 commodity code, retrieved on April 10, 2025, from https://comtradeplus.un.org/.

especially as demand for UCO in the domestic market increases. Based on those assumptions, we applied a sensitivity analysis to illustrate what would happen if total exports were to decrease or increase after incorporating UCO as SAF feedstock in the national SAF program.

Table 3 presents the results of this analysis. For Option 2, we show the range in income under the adjustable-rate service fee scheme. To calculate income from the current 9.5% service fee and the 20% service fee considered under Option 3, we used the early January 2025 UCO Free On Board (FOB) Indonesia price of $965/ton from an Argus Media report.[36] We found that the government could collect more funding for the UCOF by pursuing one of the three service fee options considered in this analysis than with the $35/ton flat rate and current 9.5% rate.

Table 3

Estimation of the total income of the Indonesian Used Cooking Oil Fund program, in billion rupiah per year

Exports	$35/ton flat fee	9.5% fee	Option 1: $210/ton flat fee	Option 2: $100–$175/ton adjustable-rate fee	Option 3: 20% fee
247,000 tons/year (2023)	137	360	821	391–684	754
150,000 tons/year (Pessimistic)	83	218	498	237-415	458
200,000 tons/year (Moderate)	111	291	665	316-554	611
300,000 tons/year (Optimistic)	166	437	997	475-831	916

Notes: The service fee is in U.S. dollars, but the total income is converted into billion rupiah using the 2024 average dollar to rupiah exchange rate of 15,822, obtained from Exchange-Rates.org, accessed on May 24, 2024, https://www.exchange-rates.org/exchange-rate-history/usd-idr-2024#:~:text=What%20was%20the%20average%20US,US%20Dollar%20%3D%2015%2C819%20Indonesian%20Rupiah.

IMPLEMENTING A UCO INCENTIVE SCHEME FOR THE SAF PROGRAM

The UCOF could be used to support production of UCO-based SAF, either by using the income to support UCO collection (e.g., by subsidizing the cost of buying UCO from a UCO collector), or by providing incentives to subsidize the production cost of UCO HEFA fuel.

Feedstock is one of the largest components of total production cost for HEFA-based SAF.[37] If the UCOF is used to subsidize the cost of UCO collection, the SAF producer would pay nothing or a reduced amount for the UCO feedstock, helping to reduce the production cost for HEFA fuel. By reducing the cost of UCO, a separate production incentive for HEFA may not be necessary to reduce the cost gap between UCO HEFA fuel and conventional fossil jet fuel. Further, allocating funding to UCO collection could bring higher quantities of UCO into the fuel market. At present, the collection rate in Indonesia is below 50%,[38] and the cost to purchase UCO is 6,000 rupiah per liter. This could change based on market price.[39] We note that the purchase price is the only public information available, and there may be additional transportation costs and other expenses for the collection process.

36 Sarah Giam, "Indonesia Necessitates UCO, Pome Oil Export Approvals," *Argus Media*, January 8, 2025, https://www.argusmedia.com/en/news-and-insights/latest-market-news/2644928-indonesia-necessitates-uco-pome-oil-export-approvals.

37 Pavlenko et al., *The Cost of Supporting.*

38 Kristiana et al., *An Estimate*.

39 "Harga Minyak Jelantah UCollect Mengikuti Harga Pasar, Bisa Cek di MyPertamina" [UCollect Used Cooking Oil Prices Follow Market Prices, You Can Check on MyPertamina], Pertamina Patra Niaga, January 17, 2025, https://pertaminapatraniaga.com/news/harga-minyak-jelantah-ucollect-mengikuti-harga-pasar-bisa-cek-di-mypertamina.

Alternatively, UCOF funding could be provided directly to HEFA SAF producers to bring production costs to a point where they are at price parity with those of fossil jet fuel. Indonesia has implemented this approach for its palm biodiesel program through POEF. Based on a previous ICCT study on Europe, assuming maximum jet fuel production, UCO HEFA production cost in Indonesia (adjusted for inflation) would be around Rp 22,902/L.[40] Based on Indonesia's 2023 wholesale jet fuel price of Rp 16,139/L, bringing the cost of UCO HEFA to cost parity with jet fuel's wholesale cost would require a subsidy of around Rp 6,763/L.[41]

According to the SAF Roadmap published by the Coordinating Ministry for Maritime Affairs and Investment, the Indonesian government aims to achieve a 1% HEFA blend in SAF in 2027, which it estimates will amount to 60,000 kiloliters of HEFA.[42] This would require an estimated 92,800 tons of UCO.[43] If the UCOF was used to support UCO collection at a rate of 6,000 Rp/L, this would amount to total required UCOF funding of Rp 605 billion per year. If UCOF funding was instead provided directly to UCO HEFA producers at a rate of Rp 6,763/L, the total incentive needed to cover the full price gap would be around Rp 406 billion per year.

Table 4 shows the extent to which UCOF funding under Options 1–3 would support 1% UCO HEFA fuel blending in 2027. Options that result in surplus income are shaded green, while options that would produce a deficit are shaded red. Yellow shading indicates a range of values that could result in either a deficit (red lettering) or surplus of funds (white lettering). As with the POEF, surplus UCOF income could be carried over to the next year to help the government cover the cost of increasing SAF blending and provide funding stability. Another option would be to devote surplus funding toward infrastructure and other investment to improve the UCO collection program.

40 Pavlenko et al., *The Cost of Supporting*.

41 Ministry of Energy and Mineral Resources, *Handbook of Energy & Economic Statistics of Indonesia* (2022), https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2022.pdf.

42 Rong wei Neo, "Southeast Asia to Play Significant Role in SAF Production but Lacks Policies, Cooperation: Boeing," *S&P Global*, July 19, 2024, https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/oil/071924-southeast-asia-to-play-significant-role-in-saf-production-but-lacks-policies-cooperation-boeing#:~:text=Singapore%20had%20introduced%20its%20SAF,levies%20collected%20from%20air%20travelers; Erin Voegele, "Report: Thailand to implement 1% SAF target in 2026," *Ethanol Producer Magazine*, July 29, 2024, https://ethanolproducer.com/articles/report-thailand-to-implement-1-saf-target-in-2026; Sarah Giam, "Indonesia to require SAF for flights from 2027," *Argus Media*, September 19, 2024, https://www.argusmedia.com/en/news-and-insights/latest-market-news/2609725-indonesia-to-require-saf-for-flights-from-2027.

43 To calculate the amount of UCO needed to meet this SAF volume, we assumed jet fuel production is maximized, with HEFA produced at a ratio of 0.59; this is based on Jane O'Malley et al., *Estimating Sustainable Aviation Fuel Feedstock Availability to Meet Growing European Union Demand* (International Council on Clean Transportation, 2021), https://theicct.org/publication/estimating-sustainable-aviation-fuel-feedstock-availability-to-meet-growing-european-union-demand/. We assume HEFA has a density of 0.7571 kg/L and that there is an HVO mix yield of 0.83 kg/kg UCO, which we retrieve from Kristin Brandt et al., Hydroprocessed Esters and Fatt Acids Techno-Economic Analysis v2.2, computer software (Washington State University, 2021), https://doi.org/10.7273/000001460.

Table 4

2027 UCOF income deficit or surplus to support 1% UCO HEFA blending, in billion rupiah per year

Exports	$35/ton flat fee	9.5% fee	Option 1: $210/ton flat fee	Option 2: $100–$175/ton adjustable-rate fee	Option 3: 20% fee
UCO purchase					
247,000 tons/year (2023)	(468)	(245)	216	(214)–79	149
150,000 tons/year (Pessimistic)	(522)	(387)	(107)	(368)–(190)	(147)
200,000 tons/year (Moderate)	(494)	(314)	60	(289)–(51)	6
300,000 tons/year (Optimistic)	(439)	(168)	392	(130)–226	311
UCO HEFA incentive					
247,000 tons/year (2023)	(269)	(46)	415	(15)–278	348
150,000 tons/year (Pessimistic)	(323)	(187)	93	(168)–10	52
200,000 tons/year (Moderate)	(295)	(115)	259	(89)–148	205
300,000 tons/year (Optimistic)	(240)	31	591	69–425	510

Table 4 shows that the previous flat $35/ton service fee and the current 9.5% service fee would not generate enough income for the UCOF to fully cover UCO purchase and HEFA production incentives at the market price level. According to these estimates, by applying a low service fee on UCO, the government is missing an opportunity to collect additional funds from high-priced export products.[44] If UCOF funding was used to pay for the purchase of UCO or to provide an incentive for UCO HEFA fuel production, assuming exports exceed 200,000 tons per year, applying a service fee above $150/ton under either a flat rate or adjustable service fee scheme would probably lead to an income surplus for the following year's program.

POLICY CONSIDERATIONS

Our findings support the following policy considerations:

UCO collection could be regulated under the central government, following examples from other countries. Indonesia's decentralized UCO collection scheme has had limited success, with a collection rate estimated below 50%. To encourage greater collection, Indonesia could consider implementing regulations that make UCO producers responsible for managing, tracking, and supplying the UCO to registered collectors. The central government could designate a ministry or agency to oversee issuing regulations for the collection practices.

Establishing a UCOF could support UCO HEFA production for the SAF program. The current palm biodiesel program, supported by the POEF, shows that government incentives can be effective in supporting the biodiesel policy. The Indonesian government could establish a UCOF to provide incentives for UCO HEFA fuel production. There are two main options for distributing the incentive: the UCOF could provide incentives for collection, or (like the POEF) it could provide a subsidy directly to fuel producers to bring the cost of UCO HEFA to parity with jet fuel's wholesale cost. Both options would help incorporate UCO into Indonesia's SAF program.

44 Greenea, *Market Watch April 2018* (2018), https://www.greenea.com/wp-content/uploads/2018/05/Greenea-Market-Watch-April-2018.pdf; Darni et al., "Asia's UCO Market."

Replacing the 9.5% service fee on UCO exports with a higher fee could help spur UCO HEFA production, with a service fee above $150/ton UCO positioning the country to achieve its 1% SAF blending mandate. In 2025, the government instituted a service fee of 9.5% of the UCO reference market price, replacing a previous service fee of $35/ton. A higher service fee, like one of the three options considered in this analysis, could be used to subsidize the domestic production of UCO HEFA. Our analysis found that providing an incentive for UCO HEFA fuel production would be less costly to the government than offering subsidies to purchase UCO. Setting a UCOF service fee above $150/ton could enable the UCOF to promote UCO HEFA production in line with the government's SAF blending mandate target with enough surplus funds to roll over to the next year to help support any increase in blending volume.

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