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Report Highlights:

In support of climate action, the Philippines calculated its carbon intensity for ethanol made from molasses and sugarcane at 46.8 gCO2e/MJ, and of biodiesel from crude coconut oil and refined coconut oil at 32.8 gCO2e/MJ and 31.5 gCO2e/MJ, respectively. Moving to a higher blend will generate more savings from avoided GHG emissions and lowers ethanol blended gasoline costs to consumers when ethanol prices fall below gasoline prices. Post sees Philippine biofuels consumption recovering in 2023 in line with economic growth, as fuel ethanol demand grows eight percent to 693 million liters and biodiesel increases 14 percent to 230 million liters driven by fuel pool increases and not higher blending. Both fuel ethanol and biodiesel programs have stagnated for years with no appreciable upward movement in blend rates despite higher aspirational goals. Ethanol production remains flat at 375 million liters due to feedstock problems. Imported ethanol fills the gap, growing by 12 percent to 310 million liters in 2023.

ACRONYMS AND ABBREVIATIONS

BIR Bureau of Internal Revenue
BOC Bureau of Customs
BOI Board of Investments
CME Coco Methyl Ester
DA Department of Agriculture
DAR Department of Agrarian Reform
DC Department Circular
DENR Department of Environment and Natural Resources
DOE Department of Energy
DOF Department of Finance
DOLE Department of Labor and Employment
DOST Department of Science and Technology
DOTr Department of Transportation
DTI Department of Trade and Industry
EPAP Ethanol Producers Association of the Philippines
EPPB Energy Policy and Planning Bureau
EV Electric Vehicle
FDA Food and Drug Administration
HB House Bill
IRR Implementing Rules and Regulations
JAO Joint Administrative Order
LMA Local Monthly Allocation
MLPY Million Liters Per Year
NABI Notice of Allowable Bioethanol Importation
NBB National Biofuels Board
NDC Nationally Determined Contribution
NREP National Renewable Energy Program
PCA Philippine Coconut Authority
PEP Philippine Energy Plan
PNS Philippine National Standard
PUV Public Utility Vehicle
RA Republic Act
RE Renewable Energy
REMB Renewable Energy Management Bureau
SAWP Social Amelioration and Welfare Program
SRA Sugar Regulatory Administration
TBAP The Biodiesel Association of the Philippines
TCPPA Technical Committee on Petroleum Products and Additives

I. Executive Summary

The Philippines has enacted two key relevant laws: the Biofuels Act of 2006 (RA 9367) and the Renewable Energy Act of 2008 (RA 9513). These laws are now 15 or more years old and other than comparatively modest blend increases which hold no technical challenges have remained largely unchanged with no new drivers to significantly raise blend, lower GHG emissions of existing fuels, or effectively bring new fuels to market. Significantly higher blending goals for existing biofuels have been promulgated but never acted upon. The Department of Energy (DOE) leads the implementation of the two laws, together with seven government entities. The National Biofuels Program provides direction under the guidance of the National Biofuels Board (NBB). In compliance with the law, the five percent blend of fuel ethanol (E5) was mandated in the second year of the Biofuels Act in 2007, and the 10 percent blend (E10) was mandated in 2011. For biodiesel, three months after the Act a one percent biodiesel (B1) blend was implemented and was increased to a two percent blend (B2) in 2009. The blends remain at B2 and E10 and the targets initially set have not been met to date.

The **Renewable Energy Act** aims to accelerate the exploration and development of RE sources such as biomass, geothermal, solar, hydropower, ocean energy sources, and wind. The National Renewable Energy Program (NREP), does not cover transport biofuels. The NREP outlines the policy framework enshrined in RA 9513 and focuses on a sustained drive towards energy security and improved access to clean energy but is silent on the contribution of biofuels. The Philippine Energy Plan 2020-2040, however, covers biofuels in the first chapter of the Renewable Energy Plan.

Domestically produced bioethanol uses sugarcane (mostly molasses) as feedstock, while biodiesel feedstock is from coconut (coconut oil transesterified into coco methyl ester or CME). Policy implementation is focused on production and consumption with no policies issued to incentivize lower carbon intensity (CI) of existing biofuels over time, another signal of stagnation. Advanced biofuels were never commercialized as has happened in the United States and Europe for renewable diesel (HDRD) and sustainable aviation fuel (SAF), to some extent in China for HDRD, and a few other countries to more limited extent.

Post sees an eight percent growth in fuel ethanol consumption to 693 million liters in 2023, and a 14 percent increase in biodiesel consumption to 230 million liters prompted by the fuel pool increases and not policy change. Biodiesel production will increase by eight percent to meet the demand. The rated production capacity of 677.9 million liters per year is a result of the industry's overexpansion in anticipation of the B5 blend and is now more than enough to cover the required blending for 12 billion liters of diesel consumption. The overcapacity of fuel ethanol plants compared to the local feedstock available is a result of the unexpected shift of seven potable alcohol producers to fuel ethanol following the implementation of a 22 percent excise tax on potable alcohol.

There is no immediate solution to insufficient feedstocks for fuel ethanol production. There are recommendations to use corn as feedstock, but this would run counter to the government's food security program and would require huge investments to establish plants, therefore corn importation was also not considered. To date, the Philippines has no option but to continue to use molasses and sugarcane. On average, local producers can only supply around 50 percent of the bioethanol requirement for gasoline blending. The remaining requirement comes from imported fuel ethanol. Fuel oil companies can import fuel ethanol only if there is a shortage, a condition, which should continue with the perennial problem of

insufficient feedstocks. Imported ethanol does not compete with local ethanol. All local ethanol must be exhausted before imports are allowed. **Imports mainly come from the United States and are forecast to reach 310 million liters in 2023** due to the expected increase in consumption. Biodiesel trade is minimal with no importation allowed under the Biofuels Act, although imported palm-oil biodiesel could offset the expected price increase of a higher blend mandate through lower-cost imported biodiesel.

II. Policy and Programs

The Philippines has enacted two laws to promote renewable energy (RE): the Biofuels Act of 2006 (RA 9367) with its implementing rules and regulations (IRR) and the Renewable Energy Act of 2008 (RA 9513) and its IRR. For key features see Biofuels Annual 2021. Below is the list of policies relative to the Biofuels Act of 2006 mostly Department Circulars (DC) issued by the Department of Energy (DOE).

Table 1. Biofuels Policies

Policy	Title	Issued	Effective
DC 2006-11-0012	Implementing the Philippine National Standard (PNS) Specification for Anhydrous Bioethanol Fuel	11/09/2006	11/20/2006
DC 2007-05-0006	Rules and Regulations Implementing RA 9367	05/17/2007	06/07/2007
DC 2008-06-0002	Implementing the PNS Specification for Biodiesel and Biofuel Blends Pursuant to RA 9367 otherwise known as the Biofuels Act of 2006	06/10/2008	06/24/2008
Joint Administrative Order (JAO) 2008-01 Series of 2008	Guidelines Governing the Biofuel Feedstocks Production, and Biofuels and Biofuel Blends Production, Distribution and Sale Under RA 9367	10/08/2008	03/20/2009
DC 2009-02-0002	Mandating a Minimum of 2 Percent Blend of Biodiesel in All Diesel and 5 Percent Bioethanol in Annual Total Volume of Gasoline	02/05/2009	02/12/2009
DC 2006-08-0011	Interim Guidelines for the Accreditation of Oil Industry Participants in the Fuel Ethanol Program	08/30/2006	08/30/2006
DC 2011-02-0001	Mandatory Use of Biofuel Blend	02/06/2011	02//27/2011
DC 2011-12-0013	Utilization of Locally-Produced Bioethanol in the Production of E-Gasoline Consistent with the Biofuels Act of 2006	12/15/2011	01/06/2012
DC 2015-06-0005	Amending DC 2011-02-0001 on Mandatory Use of Biofuel Blend	06/09/2015	06/25/2015
DC 2015-06-0007	Revised Guidelines on the Utilization of Locally-Produced Bioethanol in the Production of E-Gasoline	06/11/2015	06/25/2015
DC 2015-07-0012	Implementing the Philippine National Standard Specification for Anhydrous Bioethanol Fuel	06/29/2015	07/15/2015
DC 2016-05-006	Implementing the Modified PNS Specification for Biofuels – Coconut Methyl Ester	05/2/2016	05/30/2016
DC 2016-07-0012	Implementing Rules and Regulations for RA10745 or the Amended Biofuels Act of 2006	06/24/2016	07/29/2016
DC 2021-06-0014	Revised Circular on Accreditation and Submission of Notices and Reports by Refiners, Importers, and Own Users of Gasoline and Diesel Pursuant to the Biofuels Act	06/03/2021	06/18/2021

Source: Department of Energy (DOE)

The **Biofuels Act** seeks to reduce dependence on imported fuels by promoting the development and mandating the use of locally sourced biofuels, specifically bioethanol and biodiesel. Domestically produced bioethanol uses sugarcane (mostly molasses) as feedstock, while biodiesel feedstock is from coconut (coconut oil transesterified into coco methyl ester or CME). Policy implementation is focused on production and consumption with no policies issued to incentivize lower carbon intensity (CI) of existing biofuels over time, another signal of stagnation. Advanced biofuels were never commercialized as has happened in the United States and Europe for renewable diesel (HDRD) and sustainable aviation fuel (SAF), to some extent in China for HDRD, and a few other countries to more limited extent.

Renewable Energy and Greenhouse Gas (GHG) Emissions

The **Renewable Energy Act** aims to accelerate the exploration and development of RE sources such as biomass, geothermal, solar, hydropower, ocean energy sources, and wind. The Act envisions the Philippines to be energy self-sufficient through sustainable development of RE resources and reduce its reliance on fossil fuels, thereby minimizing vulnerability to international market price fluctuations. It encourages the development and utilization of RE sources to prevent harmful emissions. Renewable energy is an essential part of the country's low emissions development strategy and is vital to addressing the challenges of climate change, energy security, and access to energy. The National Renewable Energy Program (NREP), however, does not cover transport biofuels. The NREP outlines the policy framework enshrined in RA 9513 and focuses on sustained drive towards energy security and improved access to clean energy but is silent on the contribution of transport biofuels. The Philippine Energy Plan (PEP) 2020-2040 covers biofuels in the first chapter of the Renewable Energy Plan (page 66).

With its signing of the Paris Agreement, the Philippines pledged to reduce carbon dioxide (CO_2) and other GHG emissions by scaling up renewable energy activities using biofuels as one of the solutions. The Philippines submitted its first Nationally Determined Contributions (NDC) on April 15, 2021, committing to GHG carbon dioxide equivalent (CO_2e) emissions reduction or avoidance of 75 percent by 2030 relative to its business as usual (BAU) scenario of 2020-2030. Reduction of CO_2e emissions will come from the energy, transport, waste, agriculture, and industry sectors. There are ongoing activities being enforced across these sectors that would contribute to the NDC's fulfillment but no movement on transport biofuels in terms on increasing the blend. Most vital is transforming the country's energy sector from fossil fuel-reliant to RE-dependent. Another example is the ongoing Public Utility Vehicle (PUV) Modernization Program, which emphasizes the environmental benefits of modernizing jeepneys. Implementation has started but there are still some oppositions because of high investment costs. The full implementation is extended until December 2023. Transport accounts for one-third of GHG emissions in the Philippines. Fuel ethanol has half the carbon footprint of refined petroleum products. GHG emissions reduction in the transport sector helps in environmental savings, which lead to human health savings. FAS monitors two programs: PUV Modernization and Electric Vehicles (EVs).

Fuel ethanol reduces GHG emissions and helps meet the country's NDC commitments. The Philippines' NDC commitments have not been updated since April 15, 2021.

Biofuels Policy Framework and Mandates

Policy Framework. The DOE leads the implementation of the Biofuels Act and its IRR, and prepares the National Biofuels Program consistent with the PEP. The National Biofuels Board (NBB) was established following the law as an oversight body composed of eight government entities. The NBB acts as recommendatory body on biofuels policies, assisted by a Technical Secretariat, whose powers and functions are monitoring implementation and recommending policies to be promulgated by the DOE.

Table 2. The National Biofuels Board
Chair: Secretary, Department of Energy (DOE)
Vice Chair (Bioethanol): Administrator, Sugar Regulatory Administration (SRA)
Vice Chair (Biodiesel): Administrator, Philippine Coconut Authority (PCA)
Members: Secretaries, Department of Agriculture (DA),
Department of Trade and Industries (DTI)
Department of Science and Technology (DOST)
Department of Finance (DOF)
Department of Labor and Employment (DOLE)
Non-voting Members: Secretaries
Department of Environment and Natural Resources (DENR)
Department of Transportation (DOTr)
Department of Agrarian Reform (DAR)
Chairman of the National Commission of Indigenous People (NCIP)

Blend Mandates. The NBB determines the feasibility and recommends adjustment in the minimum mandated biofuel-blends subject to the availability of locally sourced biofuel. In compliance with the law, the five percent blend of fuel ethanol (E5) was mandated in the second year of the Biofuels Act in 2007. The 10 percent blend (E10) was mandated in 2011. The mandated blend of E10 did not reach national average for most of the past 10 years.

Table 3. Biofuels Blends: Date Mandated and Implemented		
Blend Mandate	Date Mandated and Policy	Date Implemented
Bioethanol		
E5	February 5, 2009 DC 2009-02-0002	February 12, 2009
E10	February 6, 2011 DC 2011-02-0001	February 27, 2011
Biodiesel		
B1	May 17, 2007 DC 2007-05-006	June 7, 2007
B2	February 5, 2009 DC 2009-02-0002	February 12, 2009

Source: DOE

Table 4. Biofuels Blend Targets		
Year	Biodiesel Target Blend (%)	Bioethanol Target Blend (%)
2007	1	-
2008	1	-
2009	2	5
2010	2	5
2011	2	10
2015	5	10
2020	10	20
2025	20	20/85*
2030	20	20/85*

Note: *aspirational and voluntary goal
Source: DOE

For biodiesel, three months after the Act went into effect in 2007, all diesel engine fuels sold in the country had a minimum of one percent biodiesel (B1), and this was increased to a two percent blend (B2) in 2009.

The Philippines initially set higher eventual blend targets for biodiesel and fuel ethanol, but the mandated blends have remained at B2 and E10 since 2009 and 2011, respectively. The DOE had promulgated the Philippine National Standard (PNS) for biodiesel and is set to increase the biodiesel blend to B3, B4 or B5, whichever will be agreed upon by the NBB. The DOE-Technical

Committee on Petroleum Products and Additives (TCPPA) has drafted the PNS for E20, which had already undergone its fifth deliberation on April 26, 2023. The DOE targets the E20 PNS final deliberation and endorsement to the Bureau of Product Standards (BPS) in September 2023. With these developments, E20 promulgation could happen on the fourth quarter of 2023. An increase to E20 blend would reduce dependence on imported fuel oil, reduce GHG emissions and tailpipe particulate harmful to human health, allow local ethanol to maintain a higher price without impacting the price at the pump as it is supported by much cheaper imported fuel ethanol. This, in turn, would encourage more local investment. The DOE prioritizes the finalization of the PNS for E20 (regular and premium) but will still draft the PNS for E15 as agreed upon during the TCPPA meeting on October 27, 2022. Oil companies undertake the blending of gasoline and diesel fuels with fuel ethanol and biodiesel, respectively, in compliance with the PNS, using appropriate blending methodologies at their refineries, depots, or blending facilities prior to the sale of biofuel blends.

Table 5. Biofuels Target Blending Rate

Blending Rate	PNS Number	Promulgation
Bioethanol		Target Date
E15 (regular)	For drafting	No date yet
E15 (premium)	For drafting	No date yet
E20 (regular)	DPNS/DOE QS018:2023	4th Quarter 2023
E20 (premium)	DPNS/DOE QS019:2023	4th Quarter 2023
Biodiesel		Date Promulgated
B3	PNS/DOE QS 015:2021	December 27, 2021
B4	PNS/DOE QS 017:2021	December 27, 2021
B5	PNS/DOE QS 010:2015	November 27, 2015

Source: DOE

Financial Supports for Biofuel Producers

To encourage investments, the government provides biofuels producers income tax breaks for the first seven years of operation, special realty tax rates on equipment and machinery, duty-free importation of equipment and machinery, zero-rated value added tax on purchases of goods and equipment, and zero percent value added tax rate on sale of bioethanol fuel, as stated in the RE Law of 2008.

The Board of Investments (BOI) extended a zero-VAT rating to the sale of raw materials used in biofuels production under the National Internal Revenue Code, as amended by the Expanded VAT Reform Law of 2006, in accordance with the Omnibus Investment Code of 1987 (Executive Order No. 226). BOI also provides incentives to registered biofuels manufacturers under the CREATE Act and IRR and the 2020 Investment Priorities Plan, which identifies projects under the Renewable Energy Act as among the mandatory inclusions.

The Biofuels Act contains several incentives detailed in Section 6 such as: tax exemptions for the biofuel component of the blended gasoline and diesel, and exemptions from wastewater charges imposed under Section 13 of the Philippine Clean Water Act for water effluents from biofuels production.

In accordance with Section 17B of the Biofuels Act, the Social Amelioration and Welfare Program (SAWP) has been institutionalized wherein biofuel producers contribute a corresponding "lien" per liter of biodiesel and bioethanol produced and sold. Currently, the Department of Labor and Employment (DOLE) imposed a lien of PhP0.05 per liter of CME-based biodiesel, PhP0.19 per liter of sugarcane-

based bioethanol, and PhP0.07 per liter of molasses-based bioethanol. Under the SAWP, qualified biofuel workers can take advantage of various assistance, such as for livelihood, training, education, social protection and welfare, and emergencies. The revised guidelines on the implementation on SAWP for biodiesel workers was issued June 3, 2021, while the revised SAWP for ethanol was issued in January 22, 2021, both with increasing social protection and benefits to workers. The DOLE issued referendum in 2020 for the project entitled "SAWP-Adjustment Measures Initiatives for the Biofuel Workers Affected by COVID-19 and its Mitigating Measures" with the total budget of PhP19.3 Million. To date, actual beneficiaries are 3,189 biofuel workers with actual fund utilization of 64 percent.

Impacting Fuel Pool Size Thru Incentives/Disincentives Affecting Demand

Beyond the E10 mandate, the Philippines continues to study (as it has for years) higher fuel ethanol blends in gasoline on a voluntary basis of up to 20 percent (E20). The higher voluntary blend would be facilitated through the approval of the currently drafted PNS for E20. If local ethanol production scaled up, a voluntary blend of E20 would force refined petroleum products to compete with imported ethanol and could lower prices at the pump depending on relative prices for ethanol and gasoline at any time. See GAIN Report here. Ongoing consideration and opportunity for a potential larger ethanol market with E20 blend has incentivized local producers to consider scaling current investments as well as explore non-traditional feedstocks. Increasing the biodiesel blend to B3, B4 or B5 awaits decision from the NBB. The PNS for all biodiesel blends are already promulgated.

While there have been efforts to increase blend for years, two House Bills (HB) were passed disincentivizing the biofuels industry by suspending the biofuels mandated blends. HB No. 2180 and HB No. 7059 are amending Section 5 of the Biofuels Act, both seek to reduce the retail pump price of fuel by suspending the implementation of the biofuels blend requirement of gasoline and diesel. The high cost of feedstocks resulted to higher prices of transport biofuels. Local fuel ethanol prices remain higher than gasoline prices due to high molasses prices. HB 2180 provided, that beginning August 2022, the mandatory use of biofuels shall be suspended for three years. HB 7059 provided that the President may suspend the blending in the event of abnormal inflation of fuel pump prices for a transition period deemed appropriate by the NBB, which shall be responsible for the immediate lifting of suspension when prices normalize. HB 2180 has stalled while HB 7059 is in ongoing discussion in Congress.

The Ethanol Producers Association of the Philippines (EPAP), The Biodiesel Association of the Philippines (TBAP), sugarcane stakeholders, and the Philippine Institute of Petroleum (PIP), among others opposed both HBs citing the following reasons: 1) suspension will have economic repercussions to the sugarcane and coconut farmers and to local communities with the disruption of upstream and downstream economic activities in rural areas; and 2) long-term investment of biofuel producers will be threatened and will impair ability to comply with investment contracts, loan agreements, supply contracts with farmers and other service providers. There are some policy issues to consider such as:

1. PNS to follow in the case of suspension. The intended reduction from the suspension of blending requirement may even be negated by the additional cost of new additives/oxygenates needed to replace the biofuels;
2. transition plan for the suspension and to back to B2 and E10 when the suspension period has ended. Even if the suspension is lifted, it is highly doubtful that biofuel producers will resume full operations because huge financial losses make resumption nearly impossible; and

3. suspension and going back to the B2 and E10 mandate will have impact on the documentation and on-going fuel marking program. Fuel marking doping is based on biofuels blend volume. \

On April 15, 2022, the Electric Vehicle Industry Development Act (EVIDA) lapsed into law in line with the country's policy to ensure its energy security and independence by reducing reliance on imported fuel for the transportation sector. The IRR was issued on September 2, 2022 and implemented 15 days after publication. The draft Comprehensive Roadmap for the Electric Vehicle Industry (CREVI) specified a short-term target of 2.45 million EVs, and 65,000 EV charging stations from 2023-2028 in line with the clean energy scenario. To achieve the goal of eliminating gasoline-powered cars by 2040, the national governments has laid the groundwork for a strong EV market by providing tax breaks for EV imports over the next five years (2024-2028), and other incentives such as a production-linked incentive scheme, tax rebate or research and development, subsidy for EV purchase, and reduced electricity tariff for EV charging. The Department of Trade and Industry (DTI) set the policies for the manufacturing of EVs and has issued incentives to encourage EV investment such as the removal of tariffs, excise duty exemptions, and VAT exemption for raw materials/parts/capital equipment to be used in EV manufacturing. On January 13, 2023, Executive Order No. 12 was issued, temporarily modifying the rates of import duty on EVs, parts, and components, prompting importations and setting up of sales outlets or distributorships of mostly Chinese-made EVs. The bulk of EVs in the Philippines are e-tricycles and e-motorcycles, followed by electric utility vehicles like e-jeepneys.

The DOTr is implementing a Public Utility Vehicle (PUV) Modernization Program, that calls for the phase out of jeepneys that are at least 15 years old. There are close to 180,000 jeepneys that need to be modernized, and the EV industry is targeting to fill in 10 percent of this potential demand. The full compliance to the PUV Modernization Program is extended until December 2023. Progress to date remains limited due to high investment cost, and lack of effective incentives.

Environmental Sustainability and Certification

Among the objectives of the Biofuels Act are: a) develop and utilize indigenous renewable and sustainably-sourced clean energy sources to reduce dependence on imported oil; b) mitigate toxic and GHG emissions; and c) ensure the availability of alternative and renewable clean energy without any detriment to the natural ecosystem, biodiversity and food reserves of the country. There are efforts by the Philippine government to comply with its international commitment to reduce GHG emissions through RE. The Philippine government looks into the realization of the sustainable development goals, wherein economic progress supports the protection of the environment and the health and safety of the people. The DOE-Energy Policy and Planning Bureau (EPPB) continues to monitor the GHG avoidance contribution of the actual local consumption of biofuels in the country. In 2023, fuel ethanol use in the country declined more than 810,600 tons of CO2e. To date, there is no third-party certification and GHG values released by the DOE-EPPB.

Table 6. Biofuels GHG Avoidance

Year	Bioethanol (KTCO2e)	Biodiesel (KTCO2e)
2016	499.59	551.98
2017	516.61	516.05
2018	668.81	520.39
2019	782.92	551.53
2020	609.38	406.75
2021	788.81	484.74
2022	810.60	512.53
2023 Q1	206.85	140.04

Source: DOE-EPPB

Life Cycle Assessments. In 2019, UPLB completed a study on "Life Cycle Assessment in terms of Carbon Debt and Payback Analyses, Carbon Savings and Energetics Studies of Biodiesel Production from Coconut Oil in the Philippines." The study calculated carbon intensity of Philippine biodiesel from crude coconut oil and refined coconut oil at 32.8 gCO2e/MJ and 31.5 gCO2e/MJ, respectively. However, under the current B2 blending requirement, this only results in a GHG reduction of 1.2-1.3 percent, which is still minimal (near zero) to date, though this factor would grow to 12.6-12.9 percent under a B20 scenario as earlier envisioned by DOE.

UPLB also conducted a life cycle assessment of fuel ethanol production, considering 10 out of 12 bioethanol distilleries during 2019-2020 (September to August). The study calculated the Philippines' overall ethanol carbon intensity at 46.8 gCO2e/MJ, albeit wide ranging from a 37 to 89 percent GHG reduction, depending on the ethanol plant observed. The study further estimated the adoption of an E20 mandate as earlier envisioned by DOE would result in four million tons of annual GHG savings by 2030. Environmental savings leads to human health savings. The E20 blend will help the Philippines to eliminate other oxygenates that do not specifically tie to E20.

At present, biofuel plants are not required to certify the CI of their fuels on their own nor through third-party certification. Producers are not required to comply with any GHG sustainability requirements as there is no mandatory certification for biofuels placed in the domestic market. The lack of incentives lowers the drive of biofuel producers to bring down the CI of the fuels they market. Government policy is focused on compliance with the B2 and E10 mandate, and there is no clear direction on CI certification.

The Biofuels Act does not provide the Department of Environment and Natural Resources (DENR) any specific responsibilities for its implementation. The Biofuels Act exempts biofuel investors from wastewater fees but not from the obligation to secure a discharge permit. Under the Philippine Clean Water Act, the DENR enforced sustainability requirement on water quality, which requires facilities discharging regulated effluents to secure a permit to discharge (Section 14). The implementation of the Biofuels Act is linked to the provisions and in accordance with the objective of the Philippine Clean Air Act to develop and utilize cleaner alternative fuels. To date, no third-party certification is in place with permit only issued by the government.

There are no sustainability requirements for soil management or land use. The Philippines has no comprehensive land-use policy regarding the cultivation of energy crops such as sugarcane for bioethanol or coconut for biodiesel. While the DA and DAR are mandated to determine the lands suitable to feedstock production, land use is largely determined by the local governments through ordinances. SRA monitors the sugarcane used for fuel ethanol production but there are no national standards or guidelines on how decisions are made on whether farmland is to be used for biofuel or food production.

Import Policy Including Duties

Fuel oil companies can import fuel ethanol only if domestic production cannot meet demand created by the mandate, which has been the case from the very earliest days of the fuel ethanol program. Section 5.1 and 5.2 of the Biofuels Act recognized the country's insufficient feedstocks supply to meet the mandated volume of gasoline-fuel ethanol blend (e-gasoline). DOE and DOF issued DC 2006-08-001 and Revenue Regulation No 8-2006, respectively, allowing oil companies to import fuel ethanol subject

to the guidelines issued. The NBB determines the volume and allocates among fuel oil companies for compliance of the mandated blend.

By law, during the first four years of Biofuels Act implementation, in the event of supply shortage of locally produced fuel ethanol, oil companies were allowed to import fuel ethanol and benefit from a reduced tariff, but only to the extent of the shortage as determined by the NBB (Section 5 and 6 of the IRR, RA 9367). Due to insufficient feedstocks, NBB still allows importation of fuel ethanol to comply with the mandated E10 blend requirement. The DOE promulgates the import guidelines in DC 2011-12-0013 requiring oil companies to purchase the entire monthly allocation of local fuel ethanol before they can import.

Allocation System. The bioethanol producers submit their committed volumes available for delivery to the DOE- Renewable Energy Management Bureau (REMB) on the first day of the allocating month, which is one quarter ahead of the delivery month. DOE-REMB endorses the consolidated monthly committed volumes for any given quarter to OIMB. The OIMB calculates and circulates the respective local monthly allocation (LMA) of each oil company on the 10th day of each allocating month based on the average market share. The LMA issuance serves as the regulatory mechanism for the exhaustion of local bioethanol. While imported ethanol fills in the supply gap, it is calculated based on gasoline demand. Importations of ethanol blended fossil fuels shall not be considered as part of the compliance to the LMA mandate.

The quota allocation system ensures that imports do not displace locally produced fuel ethanol. DOE DC 2015-06-0007 provides revised guidelines on the utilization of locally-produced fuel ethanol. The revised DC omitted the notice of allowable bioethanol importation (NABI). Oil companies can only import fuel ethanol equivalent to the shortage, that is, total requirement less LMA.

EPAP requested the reinstatement of the NABI as stated in DC 2011-12-0013, which was omitted in the revised guidelines on the utilization of locally produced bioethanol in the production of e-gasoline. The DOE issued DC 2021-06-0014 or the revised circular for the accreditation and submission of notices and reports of the Philippine downstream oil industry (DOI) pursuant to Biofuels Act. The circular reinforces the DOE's mandate to strictly monitor the DOI. Additional information can be accessed here.

Diversion Prevention. The Bureau of Internal Revenue (BIR) issued Revenue Regulations No. 8-2006 prescribing the implementing guidelines on the taxation and monitoring of the raw materials used and the fuel ethanol-blended gasoline produced under the bioethanol program of the DOE. Imported fuel ethanol must be denatured with two percent gasoline in accordance with the formula prescribed under these regulations. This practice prevents the diversion of imported bioethanol to other usage other than fuel, i.e., potable alcohol. The denaturing of imported fuel ethanol must be conducted in the presence of authorized representatives of the oil industry participant, DOE, BIR and Bureau of Customs (BOC) within 48 hours immediately after completion of the unloading of the fuel ethanol from the foreign vessel and transfer thereof to the Customs-bonded storage tank. The REMB conducts monitoring and sampling activities to ensure compliance to the PNS – quarterly for biodiesel and semestral for bioethanol producers.

The HS Codes for ethanol (excluding beverage ethanol) are 2207.10 and 2207.20. Currently, there is no import tariff on ethanol as tariffs fell to zero in 2016 (ASEAN) and 2020 (Most Favored Nation). A one

percent duty is paid on imported ethanol destined for gasoline blending that the oil companies pay. Biodiesel is harmonized under HS Code 3826.00 (pure biodiesel and biodiesel blends down but not including 30 percent while petroleum oils containing 1-30 percent biodiesel by volume use HS Code 2710.20.

III. Ethanol

Table 7. Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)										
Calendar Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023f**
Beginning Stocks	na	na	na	na	na	25	14	14	10	18
Fuel Begin Stocks	na	na	na	na	na	25	14	14	10	18
Production	na	na	na	na	na	375	344	400	402	402
Fuel Production	115	168	230	235	297	346	280	355	375	375
Imports	na	na	339	322	347	341	322	385	398	410
Fuel Imports	339	311	260	276	285	257	241	225	277	310
Exports	0	0	0	0	0	0	2	4	0	0
Fuel Exports	0	0	0	0	0	0	0	0	0	0
Consumption	na	na	na	na	na	727	664	785	792	820
Fuel Consumption	454	479	490	511	557	614	521	584	644	693
Ending Stocks	na	na	na	na	25	14	14	10	18	10
Fuel Ending Stocks	na	na	na	na	25	14	14	10	18	10
Refineries Producing Fuel Ethanol (Million Liters)										
Number of Refineries	7	8	10	10	12	12	12	13	13	13
Nameplate Capacity	207	222	282	282	381	381	381	426	466	466
Capacity Use (%)	55.6%	75.7%	81.6%	83.3%	78.0%	90.8%	73.5%	83.3%	80.4%	80.5%
Co-product Production (1,000 MT)										
Bagasse	150	45	17	12	3	88	150	102	164	170
Feedstock Use for Fuel Ethanol (1,000 MT)										
Sugarcane	500	150	55	40	200	190	502	340	547	570
Molasses	340	650	930	950	1,080	1,240	1,076	1,340	1,344	1,340
Sugar	5	0	0	0	0	0	0	0	0	0
Market Penetration (Million Liters)										
Fuel Ethanol Use	454	479	490	511	557	614	521	584	644	693
Gasoline Pool 1/	4,505	5,174	5,692	6,199	6,441	6,973	5,636	6,757	7,091	7,625
Blend Rate (%)	10.1%	9.3%	8.6%	8.2%	8.6%	8.8%	9.2%	8.6%	9.1%	9.1%

Note: f = forecast
na = neither government nor industry sources can provide stocks and production data from 2014 to 2018
1/= covers gasoline and all biocomponents (ethanol)
Conversion: 1MT of molasses = 246 liters of ethanol, 1MT of sugarcane = 80 liters of ethanol (average)
Source: DOE, SRA, Bureau of Internal Revenue, with Post estimates for 2023

Consumption

Post forecasts an eight percent growth in consumption to 693 million liters in 2023 attributed solely to increased fuel pool size as the Philippines recovers from the COVID-19 pandemic. The expected growth relates to the increasing car purchases in 2023 with double digit growth compared to the same period in 2022. The total consumption of fuel ethanol reached 644 million liters in 2022 due to growth in the gasoline pool to 7.1 billion liters during the year.

Table 8. Gasoline Pool and Fuel Ethanol

Year	Gasoline Demand (million liters)	Bioethanol Blend (Target)	Supply Requirement (million liters)	Estimated Equivalent Feedstock Requirement (million metric tons)	
				Sugarcane	Molasses
2023	7,625	10%	763	3.81	2.02
		20%	1,525	7.63	4.05
2024	8,200	10%	820	4.10	2.18
		15%	1,230	6.15	3.26
		20%	1,640	8.20	4.35
2025	8,818	10%	882	4.41	2.34
		15%	1,323	6.61	3.51
		20%	1,764	8.82	4.68
2026	9,483	10%	948	4.74	2.52
		15%	1,422	7.11	3.77
		20%	1,897	9.48	5.03

Source: DOE-OIMB and DOE-EPPB

Imports supplied most of domestic demand in the early years of the fuel ethanol program. With the expansion of domestic production capacity, the industry was able to reach up to 50 percent of domestic demand by 2016. Since then, the ability of the domestic industry to supply demand has stagnated at around 50 percent, with imports covering the remaining 50 percent of the E10 mandate. Over time, imported fuel ethanol is expected to cover a growing portion of total consumption because local production is expected to face continued feedstock supply constraints.

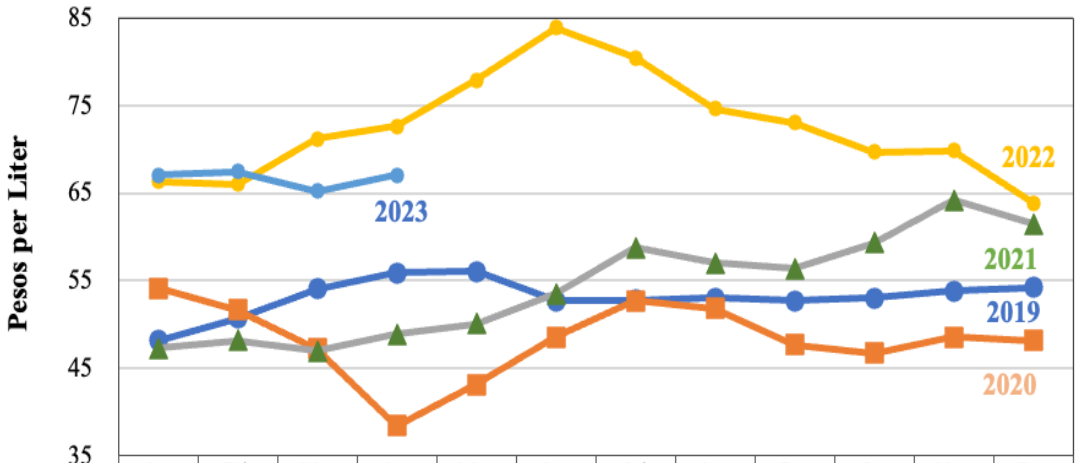
Prices. In the past four years, the lowest gasoline prices were seen in April 2020 when the Philippines imposed a series of lockdowns due to COVID-19. In 2022, crude oil prices have risen and peaked in June due to global supply/demand imbalances aggravated by the conflict between Russia and Ukraine that has destabilized markets. Local and imported gasoline compete openly on price, while imported fuel ethanol does not compete with local ethanol nor with local gasoline. The Philippines experienced and continues to experience sudden increases in at-the-pump prices of fossil fuel, which prompted the proposal to suspend the Biofuels Act. EPAP opposed the proposal and is pushing to raise the blend to E15 or E20 to reduce gasoline prices and GHG emissions. EPAP acknowledges that domestic ethanol is expensive, and that oil companies and consumers have benefitted from cheaper imported fuel ethanol, which drives down the retail price of gasoline.

Table 9. Fuel Ethanol Prices In PhP/liter

Month	Local	Imported
Jan	61.46	37.64
Feb	62.97	37.80
Mar	63.92	43.98
Apr	64.44	46.17
May	65.78	49.51
Jun	68.50	51.36
Jul	69.50	48.60
Aug	70.64	48.54
Sep	74.50	49.00
Oct	75.50	51.22
Nov	78.83	51.27
Dec	80.01	45.43

Source: DOE-REMB and OIMB

Figure 1. Monthly Gasoline Prices, 2019-2022



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	48.17	50.75	54.09	55.89	56.05	52.74	52.83	53.00	52.73	53.05	53.84	54.19
2020	54.14	51.71	47.25	38.50	43.12	48.60	52.75	51.85	47.67	46.71	48.54	48.19
2021	47.30	48.18	46.98	48.86	50.05	53.54	58.80	57.05	56.40	59.30	64.16	61.44
2022	66.36	66.02	71.20	72.65	77.89	83.85	80.45	74.63	72.98	69.65	69.82	63.88
2023	67.01	67.44	65.23	67.01								

2022 $/gallon	
Jan	4.90
Feb	4.87
Mar	5.18
Apr	5.29
May	5.63
Jun	5.93
Jul	5.45
Aug	5.07
Sep	4.81
Oct	4.48
Nov	4.58
Dec	4.34

Source of data: DOE-OIMB

Economic Impacts of Higher Blend Rates. Had the Philippines maintained its earlier timeline to move to higher blend of E15 and E20, using current May 15, 2023 prices, it would have decreased the gasoline pump price by 1.1 percent and 2.1 percent, respectively, resulting in average annual savings equivalent to PhP4.2 billion ($75 million) and PhP8.3 billion ($149 million). This environment, however, would have also facilitated an opportunity to share a portion of gained consumer welfare with local fuel ethanol producers via higher prices for locally produced fuel ethanol, which in turn, would have encouraged local producers to maximize production.

Table 10. Pump Price Impacts of Higher Blend Rates

Blend	Pump Price E10-Equivalent	Consumer Welfare	Equivalent Peso Value (PhP Million)
E15	0.9891	.0106	4,166
E20	0.9781	.0212	8,332

Note: Gasoline – (average first half of May 2023) – PhP 64.50/liter
Bioethanol Reference Price (average first half May 2023) – PhP82.82/liter
Imported Ethanol (May 15, 2023) - $0.78/liter + 20% = Landed Subic – PhP52/liter
Forex (May 15, 2023) - $1: PhP55.77 (Source: Bangko Sentral and Pilipinas)

Production

Post forecasts fuel ethanol production to be flat at 375 million liters in 2023 due to feedstock problems. Competitiveness of the local sugarcane industry to provide the needed feedstock remains a challenge. From the Sugar Annual Report 2023, Post expects raw sugar production to remain low at 1.9 million metric tons (MT), with cane production expected to be about 21.8 million MT. As in recent

years, feedstock supply will be limited for fuel ethanol production, requiring imports to cover growth in fuel consumption. Since the implementation of the Biofuels Act in 2007, investments in distilleries have contributed to industry growth.

Table 11. Bioethanol Production Milestones

Year	Number of Distilleries	Annual Rated Capacity (million liters)	Annual Production (million liters)	Capacity Utilization (%)	Annual Blend Rate (%)
2008	1	Na	0.97	Na	Na
2009	2	39.00	23.23	59.6	2.3
2010	3	69.00	10.17	14.7	3.8
2011	3	69.00	4.14	6.0	5.6
2012	4	123.00	34.54	28.1	6.9
2013	4	123.00	71.54	58.2	8.5
2014	7	207.12	114.86	55.5	10.1
2015	8	222.12	167.87	75.6	9.3
2016	10	282.12	230.18	81.6	8.6
2017	10	282.12	234.65	83.2	8.2
2018	12	380.50	296.54	77.9	8.6
2019	12	380.50	346.14	91.0	8.8
2020	12	380.50	279.58	73.5	8.8
2021	13	425.50	354.60	83.3	8.6
2022	13	466.00	374.78	80.4	9.7

Source of basic data: DOE and SRA

The PEP 2020-2040 has set the targets for fuel ethanol production capacity on the assumption that all supply requirements are to be produced locally. See Biofuels Annual 2022 for historical developments. Currently, the main feedstocks are sugarcane-based materials, i.e., molasses and sugarcane juice. Only three fuel ethanol producers (San Carlos Bioenergy, Green Future Innovations, and Progreen Agricorp) use sugarcane as feedstock, the rest use molasses. While 80 percent of total molasses in the country is used for ethanol production, supply is still not sufficient. The industry looks at corn and other potential feedstock, i.e. sweet sorghum, cassava, nipa and sweet potato, but these are still in the research stage and will take time to produce alternatives to sugarcane commercially for bioethanol processing, if they can achieve success at all. The DOE has recent projects on biofuels on nipa sap as feedstock and cellulosic ethanol production technology. Corn as feedstock poses problems because of the food versus fuel dilemma. Corn is also not included in the list of crops in the guidelines governing biofuels feedstock production (DOE JAO No. 2008-1). Corn can be allowed if from newly opened corn areas but not from existing corn production areas, thereby avoiding conflict with food security issues. To use corn, existing bioethanol plants need to invest in corn processing and fermentation which requires a different processing technology. Current ethanol plants are only equipped to process molasses and sugarcane juice. In 2022, one producer has signaled interest to look into corn ethanol production but has stalled

Table 12. Fuel Ethanol Production Capacity Targets (In Million Liters)

Year	Fuel Ethanol Production Capacity
2020	380.50
2025	944.15
2030	1,354.26
2035	1,913.05
2040	2,579.34

Source: PEP 2020-2040, DOE

given the recent increases in corn prices. Brazil is the only country that has successfully developed a dual nationwide sugarcane-corn processing industry.

There is no immediate solution to insufficient feedstock. Molasses, a byproduct of sugar production, is dependent on the volume of sugarcane harvested and milled. For the past decade, the production of sugarcane exhibited a fluctuating trend attributed to declining sugarcane areas, adverse weather conditions, high cost of inputs i.e. fertilizer, declining farm labor force, and highly acidic or degraded soils for sugarcane planting.

The Philippines will continue to use molasses and sugarcane juice. The high demand for molasses had driven up its price in previous years. Sugarcane planters are benefiting from the high molasses prices, but this has resulted in high fuel ethanol prices. The SRA releases the Bioethanol Reference Price twice a month as benchmark for the price negotiations of oil companies and bioethanol producers to establish a level playing field.

Table 13. Molasses Price and BRP

Marketing Year (September-August)	Molasses Price (PhP/MT	Sugar Composite Price (PhP/Lkg)	Bioethanol Price Index (PhP/Li)
2016-2017	8,544	1,430	53.68
2017-2018	6,364	1,440	50.96
2018-2019	9,694	1,532	57.40
2019-2020	11,828	1,484	61.07
2020-2021	9,352	1,500	57.07
2021-2022	13,179	2,044	65.79
2022-2023	13,576	3,200	81.68

Source: SRA

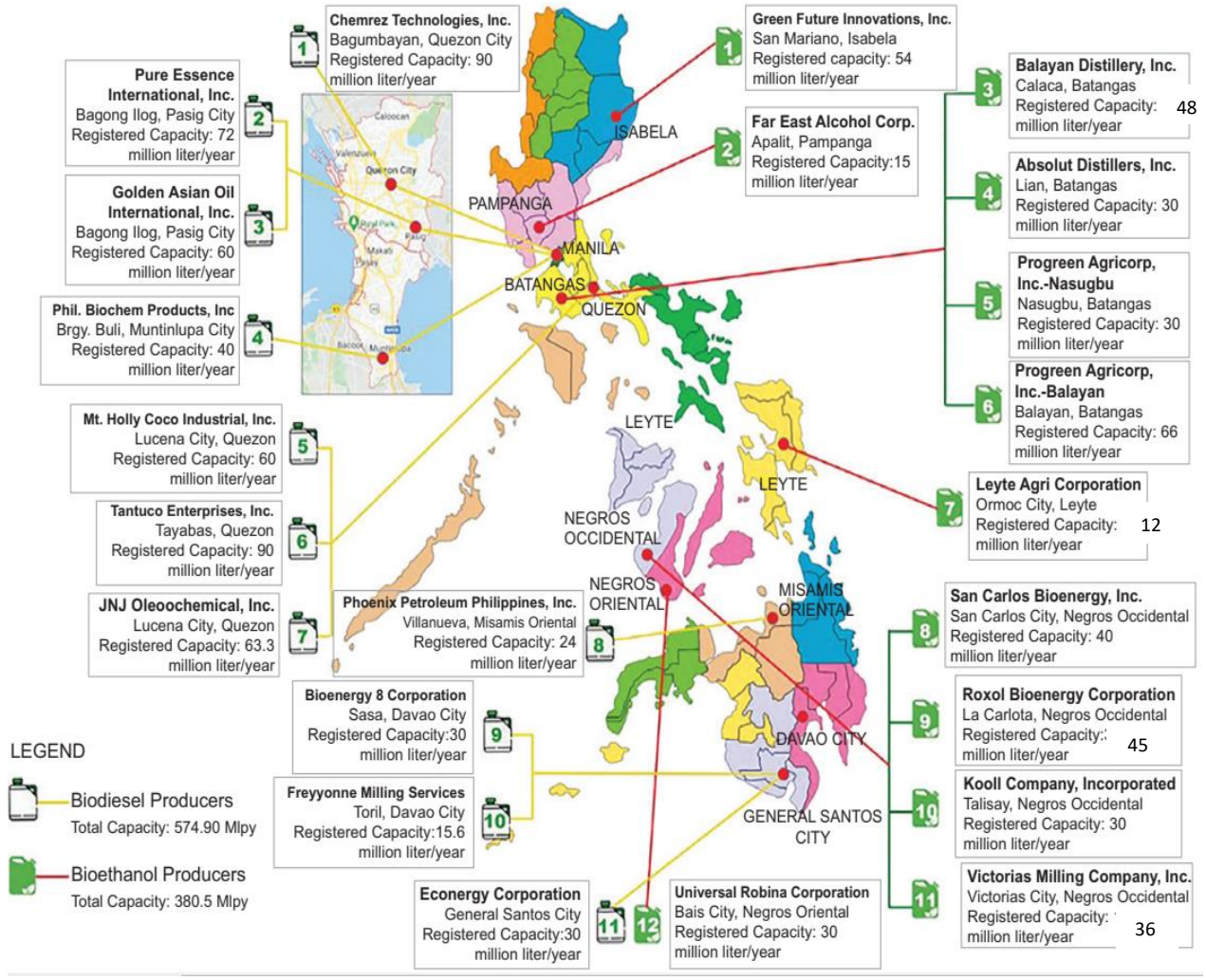
By law, imported molasses for use as a biofuel feedstock is not allowed. The EPAP proposed to temporarily allow importation of molasses to maximize plant capacity given current high fuel prices. The DOE declined such a proposal in 2020 with sugar planters, millers and the SRA also opposed during the stakeholders' consultations in August 2021. EPAP also discussed the proposal with the Philippine Senate but received no decision. EPAP hopes the new government will back such a proposal for the development of the biofuels industry.

Meanwhile, imported molasses is allowed as feedstock in the production of denatured alcohol for industrial use. The DOE allowed the bioethanol producers to repurpose their production processes from fuel use to medical use. Five bioethanol producers went into production of medical grade alcohol or rubbing alcohol to increase the country's supply of the needed alcohol due to COVID-19. The Philippine Food and Drug Administration (FDA) issued interim guidelines for the provisional licenses to operate and certificates of product notifications for all rubbing alcohol through FDA Memorandum Circular 2020-001. In 2022, about 27.2 million liters of rubbing alcohol were produced locally, 64 percent lower than 2021 production of 44.7 million liters. During the peak of COVID-19 in 2020, about 64 million liters of rubbing alcohol were produced by bioethanol producers Victorias, Progreen (Balayan and Nasugbu), Kooll Company, and Far East Alcohol. According to EPAP, ethanol producers donated about 1.5 million liters to hospitals, government offices, local government units, and schools as part of the producers' corporate social responsibility.

There are 13 accredited bioethanol producers in the Philippines, with a total production capacity of 466 million liters per year (MLPY) in 2022. Additional capacity of 38 MLPY is expected by the end of 2023 and potential additional capacity of 45 MLPY under negotiation. The current capacity utilization is equivalent to about 80 percent of the volume requirement for the E10 mandate.

The overcapacity of fuel ethanol plants compared to the local feedstock available is a result of the unexpected shift of seven potable alcohol producers to fuel ethanol following the implementation of a 22 percent excise tax on potable alcohol.

Figure 2. Philippine Biofuels Producers



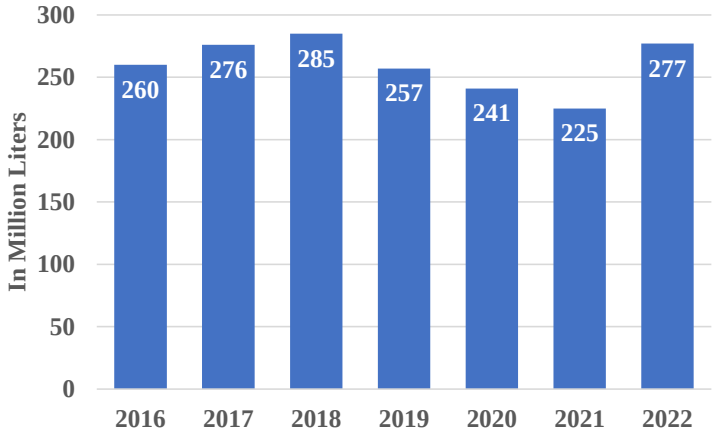
Source: PEP 2018-2040

Trade

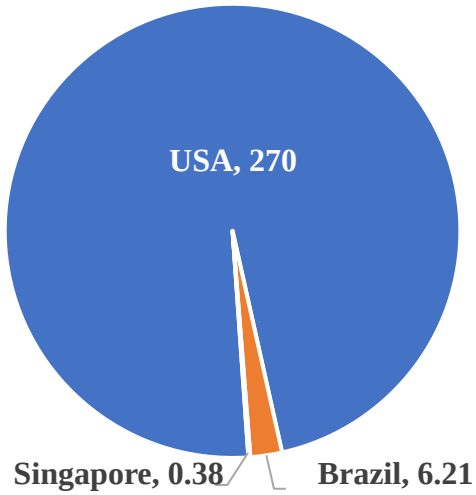
Imports were almost entirely sourced from the United States now several years ongoing although there were a few early years in which Thailand was a key supplier for a few prior years. **Total fuel ethanol imports in 2023 will escalate to 310 million liters due to the rise in consumption with no corresponding growth in domestic production.** Local ethanol remains the priority but imports will continue to cover around 50 percent of the needed supply for gasoline for the E10 blending.

Figure 3. Fuel Ethanol Imports, 2022

Volume in Million Liters



By Country Source



Source: SRA and DOE

As of May 2023, there are 23 accredited importers of fuel ethanol composed of the top fuel oil companies (Petron, Shell, Chevron) and fuel traders who supply small players.

Table 14. Accredited Downstream Oil Industry Biofuel Participants

1. Petron Corporation	13. Insular Oil Corporation
2. Pilipinas Shell Petroleum Corporation	14. Warbucks Industries Corporation
3. Chevron Philippines, Inc.	15. Warbucks Southern Corporation
4. PTT Philippines Corporation	16. ERA 1 Petroleum Corporation
5. Seaoil Philippines, Inc.	17. Power Fill International Subic Inc.
6. Unioil Petroleum Philippines, Inc.	18. Vmaximus Subic FreePort Corp.
7. Jetti Petroleum Inc.	19. APEX Petroleum OPC
8. Phoenix Petroleum Philippines, Inc.	20. Trafigura Philippines Inc.
9. Filoil Logistics Corporation	21. Goldenshare Commerce & Trading, Inc.
10. Marubeni Philippines Corporation	22. South Brookville Trading Corp.
11. Micro Dragon Petroleum, Inc.	23. Felcor Petroleum Depot Corporation
12. High Glory Subic International Logistics, Inc.	

Source: DOE

IV. Biodiesel

Table 15. BIODIESEL (Million Liters)										
Calendar Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023f**
Beginning Stocks	20	29	32	41	57	53	64	56	47	48
Production	172	204	227	220	220	242	188	198	203	220
Imports	0	0	0	0	0	0	0	0	0	0
Exports	0	0	0	0	0	0	0	0	0	0
Consumption	163	201	218	204	224	231	196	207	202	230
Ending Stocks	29	32	41	57	53	64	56	47	48	38
Production Capacity (Million Liters)										
Number of Biorefineries	11	11	11	11	11	12	13	13	13	13
Nameplate Capacity	585	585	575	575	575	608	708	708	678	678
Capacity Use (%)	29.4%	34.9%	39.5%	38.3%	38.3%	39.8%	26.6%	28.0%	30.0%	32.4%
Feedstock Use (1,000 MT)										
Coconut Oil	158	187	208	202	202	222	172	182	187	221
Market Penetration (Million Liters)										
Biodiesel, on-road use	163	201	218	204	224	231	196	207	202	230
Diesel Pool, on-road use	6,579	7,334	7,701	8,086	8,200	8,413	6,440	7,460	8,191	8,639
Blend Rate (%)	2.1%	2.3%	2.3%	2.0%	2.0%	2.0%	2.0%	2.0%	1.9%	2.0%
Diesel Pool, total 1/	7,778	8,793	9,535	10,159	11,207	11,534	9,786	10,355	10,921	11,518

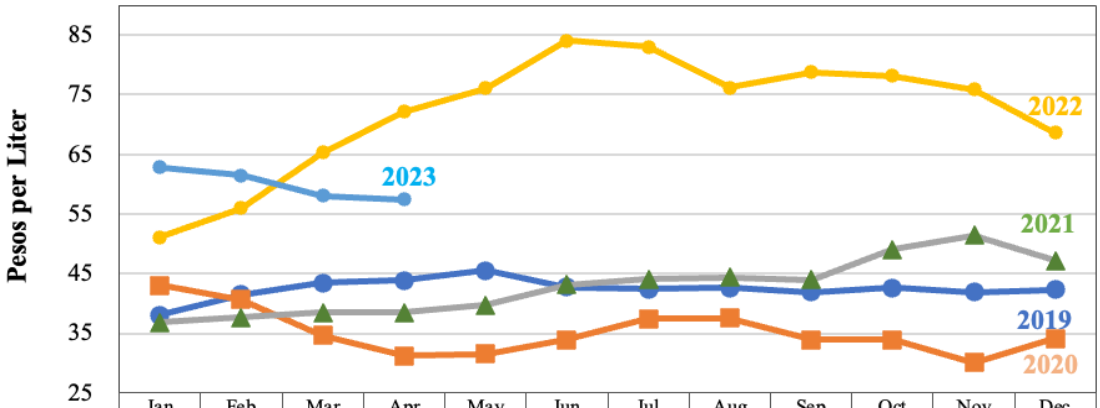
Note:
1/ Diesel pools include all blended biodiesel.
f-forecast.
Feedstock biodiesel conversion: 1 MT of coconut oil yields 1,090 liters of biodiesel.
Source: DOE, with Post estimates for 2023

Consumption

The Philippines Biodiesel Association (TPBA) advocates for gradual increase from B2 to B3 to B5. The DOE awaits the NBB endorsement to increase the blend mandate. **Post forecasts biodiesel consumption to reach 230 million liters in 2023 with B2 average blend rate**, a volume 14 percent higher than in 2022, mostly due to the growth in diesel pool.

Prices. Blended diesel is sold at retail stations for on-road and off-road use, including agricultural use (e.g. tractor, inland boats). Large mining companies maintain their own fuel depots on-site for their equipment, sourcing their supply directly from fuel companies.

Figure 4. Monthly Prices of Diesel, 2019-2023



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	38.11	41.53	43.50	43.91	45.55	42.70	42.40	42.68	41.89	42.60	41.96	42.38
2020	43.11	40.63	34.72	31.29	31.61	33.98	37.44	37.56	33.99	33.91	30.09	34.17
2021	36.87	37.63	38.52	38.50	39.74	43.14	44.14	44.38	44.04	49.09	51.47	47.16
2022	51.15	55.99	65.33	72.19	76.10	84.04	82.98	76.14	78.75	78.17	75.87	68.67
2023	62.79	61.45	58.05	57.48								

2022 $/gallon	
Jan	3.78
Feb	4.13
Mar	4.75
Apr	5.26
May	5.50
Jun	5.94
Jul	5.62
Aug	5.17
Sep	5.19
Oct	5.03
Nov	4.98
Dec	4.67

Source: DOE-OIMB

Over the years, examining price trends and gaps in the Philippines between biodiesel and fossil diesel raising the blend higher from B2 would lead to even higher diesel fuel cost. Through the years, as is mostly true in other countries, biodiesel prices in the Philippines remain higher than the price of fossil diesel, often considerably higher unless unless the lower carbon intensity (CI) of biofuesel is priced into the market thru a carbon credit/debit scheme or taxes that penalize higher carbon emission fuels. These schemes are not uncommon elsewhere. This price effect (which is relatively very small on low-blended biodiesel-diesel blends), however, does not prevent the PCA to push for the increase in the biodiesel blend in support of the livelihood of around 2.5 million coconut farmers. An evaluation of the effects in the coconut oil industry, however, and a calculation of diesel price increases need to be studied. That said, at low-blend rates, any price increase in the blended fuel over pure fossil diesel is largely 'washed-out' by the wide swings in oil and fossil diesel prices on the international market seen year after year. **By law, importation of biodiesel is not allowed, which could be the solution to manage the increase in diesel pump prices.**

Table 16. Prices of Diesel, CME and CNO

Year	Diesel Price (a) (PhP/Li)	Biodiesel (CME) Price Range (b) (PhP/Li)	Crude CNO Local Price (c) (PhP/Kg)
2011	43.94	57 – 106	78.25
2012	43.67	30 – 88	48.15
2013	41.93	29 – 60	39.73
2014	41.04	38 – 75	61.98
2015	27.46	43 – 72	55.25
2016	25.43	45 – 85	74.45
2017	31.78	45 – 92	90.41
2018	42.16	40 – 91	79.97
2019	41.60	35 – 70	51.73
2020	34.71	35 – 75	49.19
2021	42.16	58 – 90	97.16
2022	72.12 (b)	68 – 96	82.37

Source: (a) ADB Key Indicators Database Philippines
(b) DOE
(c) United Coconut Association of the Philippines

Production

Should the government mandate B5, the available biodiesel plant capacity is more than enough to supply the B5 requirement. However, while coconut production is abundant in the Philippines, the bulk of coconut oil goes to traditional exports, reducing available supply for biodiesel producers. **Post forecasts a growth of eight percent in biodiesel production to 220 million liters due to growth in consumption.** While DOE targets the increase in blending, when will this happen remains a question. Considering that is it already the middle of the year, any volume uptake would take effect no sooner than the fourth quarter of 2023. There is no certainty an increase is forthcoming. The below table from DOE gives the outlook for domestic fuel supply and feedstock under four blend scenarios. The fuel pool growth rate seems reasonable, however, the 2023 starting point is about 2MLs too high.

Table 17. Diesel Pool and Biodiesel Requirement

Year	Diesel Demand (million liters)	Biodiesel Blend (Target)	Supply Requirement (million liters)	Estimated Equivalent Feedstock Requirement	
				CNO (kMT)	Nut (Billion)
2023	13,650	2%	230	213,083	1,567
		3%	346	319,625	2,350
		4%	461	426,166	3,134
		5%	576	532,708	3,917
2024	14,342	2%	243	224,757	1,653
		3%	364	337,135	2,479
		4%	486	449,513	3,305
		5%	607	561,891	4,132
2025	14,907	2%	256	237,041	1,743
		3%	384	355,561	2,614
		4%	513	474,081	3,486
		5%	641	592,601	4,357
2026	15,543	2%	270	250,009	1,838
		3%	405	375,014	2,757
		4%	541	500,018	3,676
		5%	676	625,023	4,596

Source: DOE-OIMB and DOE-EPPB

The PEP 2020-2040 has set the production capacity targets for biodiesel with cumulative targets under the Clean Energy Scenario (CES). Two prospective investors have signified interest to construct biodiesel facilities with a combined potential capacity of 127.65 MLPY. As of December 31, 2022, there are 12 accredited biodiesel producers, with total production capacity of 677.9 MLPY, equivalent to about 295 percent of volume requirements for the B2 mandate. The overcapacity in serving the B2 blend is a result of the over expansion of the industry in anticipation of the shift to B5 as guided by the PEP. Additional capacity of 288.88 million liters is expected by end of 2023. The actual production of 203 million liters in 2022 was only 30 percent

Table 18. Biodiesel Production Capacity Targets In Million Liters

Year	Target
2020	707.90
2025	1,086.78
2030	1,086.78
2035	1,331.93
2040	1,733.04

Source: PEP 2020-2040, DOE

of the registered capacity. The total production capacity of 707.90 MLPY declined because one biodiesel producer with rated a capacity of 30 MLPY had its DOE accreditation revoked.

Increasing the biofuels blend requires constant development of locally produced feedstock sources to ensure adequate supply. Research and development of biofuel production and utilization is one of the responsibilities of the DOST. Its recent project is called Biomass as Green Energy Source. The DOST-Industrial Technology and Development Institute (DOST-ITDI) completed in December 2019 the study entitled Characterization/Performance Testing of the Biodiesel/Diesel Blends from Combined Feedstock of Various Vegetable and Used Cooking Oils. Biodiesel was produced from various feedstocks, namely: refined palm oil, used cooking oil, and rubber seed oil through optimized processes. Results of the analyses showed methyl esters from palm oil, used cooking oil, and rubber seed oil can be blended with CME for use as fuel additive to petroleum diesel.

Trade

No trade is allowed under the Biofuels Act, although imported palm-oil biodiesel could offset the expected price increase of a higher blend mandate through lower-cost imported biodiesel.

V. Advanced Biofuels

The Philippines focuses on finding new feedstock to produce more biofuels. The National Bioenergy Research and Innovation Center (NBERIC) was established in 2018 to realize R&D projects in bioenergy. NBERIC collaborates with various institutions on bioethanol R&D to maximize the NBERIC facility located at the Mariano Marcos State University (MMSU) in Batac, Ilocos Norte in northern Philippines. The USAID-Science, Technology, Research and Innovation for Development (STRIDE) has been instrumental in the establishment of NBERIC. The United States Grains Council signed a Memorandum of Understanding with MMSU in July 2022 to establish a cooperative partnership, which facilitates the exchange of expert knowledge, technical information, and best practices as they relate to biofuels industry and policy development.

The Pampanga State Agricultural University (PSAU) established the Bio-Energy Laboratory in 2017-2019 to determine the potential of these enormous volume of agricultural resources, products and wastes in Central Luzon as biofuels. The laboratory focuses on the thermal conversion and characterization of biomass used of agricultural wastes and other lesser studied agricultural resources.

The DOST-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD) and the Industrial Technology Development Institute (ITDI) conduct R&D on biofuels in collaboration with other institutions such as DOE, DA, PCAARRD, and academia, particularly the UPLB and UP Visayas.

Bio-oil production from agricultural waste (2014-2020). Pyrolysis was conducted on corn stover using a prefabricated reactor. Optimum conditions on temperature, time, and catalyst have yielded corresponding improvements in bio-oil and char yields. Recommendations for further studies include scaling up of equipment and facilities to support bio-oil production from other agricultural waste sources, working on higher pyrolysis temperature, and economic analysis to determine cost efficiency of the bio-oil and char.

Fuel ethanol production from lignocellulosic feedstock (2009-2014). UPLB carried out the program on Fuel Ethanol Production from Lignocellulosic Feedstock aimed to determine possible candidates for feedstock, evaluation and optimization of pre-treatment methods, and development of micro-organism for the ethanol production. The project was able to produce ethanol and fermentation efficiencies were comparable with existing literatures but further R&D is required to improve the yield.

Microalgae experiments were done by DOST and UP Visayas at the laboratory stage but the economic feasibility for commercial-scale production must be established. Likewise, studies on used vegetable oils, particularly from the fast-food chain, were conducted by DOST, and more studies are needed on raw material quality control, and process optimization since the resulting biodiesel had difficulty passing the standards. For bioethanol, DOST and UPLB have undertaken studies on sweet sorghum, and the economic feasibility of its cultivation vis-à-vis sugarcane needs to be ascertained.

A project funded by the National Biofuel Board (NBB) was completed by the ITDI in 2018 on multi-feedstock (coconut oil, palm oil, used oil, rubber oil) production of biodiesel, and further studies are needed for engine testing. These initiatives focused on viability of feedstocks and may not be considered advanced technology as has been solicited.

Sustainable Aviation Fuel (SAF)

SAF production from coconut oil was initially intended for adoption as aviation fuel. However, reduction in fuel prices at the time redirected the project into the above-mentioned bio-oil production from agricultural waste. The Philippines eyes aviation fuel to be part of a continuing roadmap on energy (Energy Efficiency and Waste to Energy) programs.

Among local airlines in the Philippines, Cebu Pacific (CEB) has started to use SAF in its Airbus 320neo (New Engine Option). On September 2022, CEB signed a Memorandum of Understanding (MOU) with Shell Eastern Petroleum to make SAF more widely available. The MOU explores the foreign supply and purchase of SAF in the Asia-Pacific and the Middle East region, with an initial supply volume of at least 25 kilotons per year. CEB seeks to further utilize SAF by launching green routes in approximately three years. One challenge, however, is the high price, making it uncertain if the higher use of SAF will impact CEB's low-cost business model. Philippine Airlines (PAL), the country's flag carrier, is also working toward developing sustainable fuel for its airline fleet. PAL supports the zero-emission initiative of the IATA. PAL is already working on its plan to incorporate SAF into its operations. SAF is a key part of the aviation industry's plan to reduce carbon emissions. SAF reduces the carbon intensity of air travel by up to 80 percent over its life cycle. Please see GAIN Report on SAF here.

The Philippines participated in the Sustainable Aviation Fuel Workshop as part of the U.S.-Southeast Asia and Pacific Aviation Cooperation Program (ACP) Workshop Series hosted by the U.S. Trade and Development Agency and U.S. Federal Aviation Administration in Bangkok, Thailand from May 22-25, 2023. The workshop focused on identifying waste and biomass feedstock availability, analyzing new pathways to optimize SAF production, and assessing infrastructure needs and logistical requirements for SAF supply chain development. The workshop also highlighted U.S. companies offering cutting-edge conversion technology to process feedstock into fuel that meets ASTM standards.

Attachments:

No Attachments