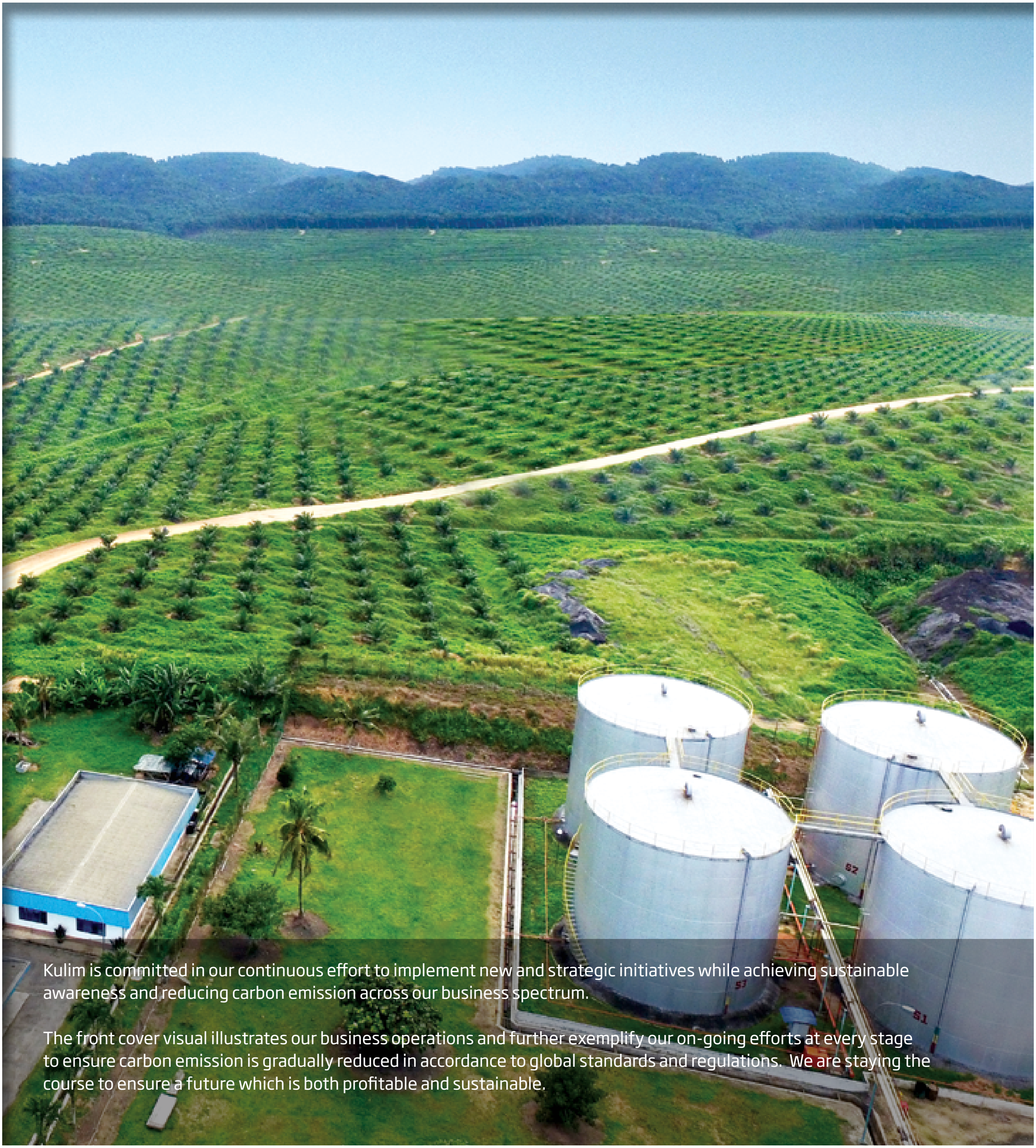
Kulim (Malaysia) Berhad (23370-V)

Kulim (Malaysia) Berhad

Carbon Footprint Report 2018



Kulim is committed in our continuous effort to implement new and strategic initiatives while achieving sustainable awareness and reducing carbon emission across our business spectrum.

The front cover visual illustrates our business operations and further exemplify our on-going efforts at every stage to ensure carbon emission is gradually reduced in accordance to global standards and regulations. We are staying the course to ensure a future which is both profitable and sustainable.

INSIDE THIS
CARBON FOOTPRINT REPORT
2018

KULIM (MALAYSIA) BERHAD

01. HIGHLIGHTS

OUR ACHIEVEMENTS

Emissions from POME reduced by

36% from a 2016 peak

1.01 MT CO_2e per MT CPO/PK – our smallest carbon footprint achieved to date

OUR GOALS BY 2025

Biogas capture facilities installed at

100%

of our mills

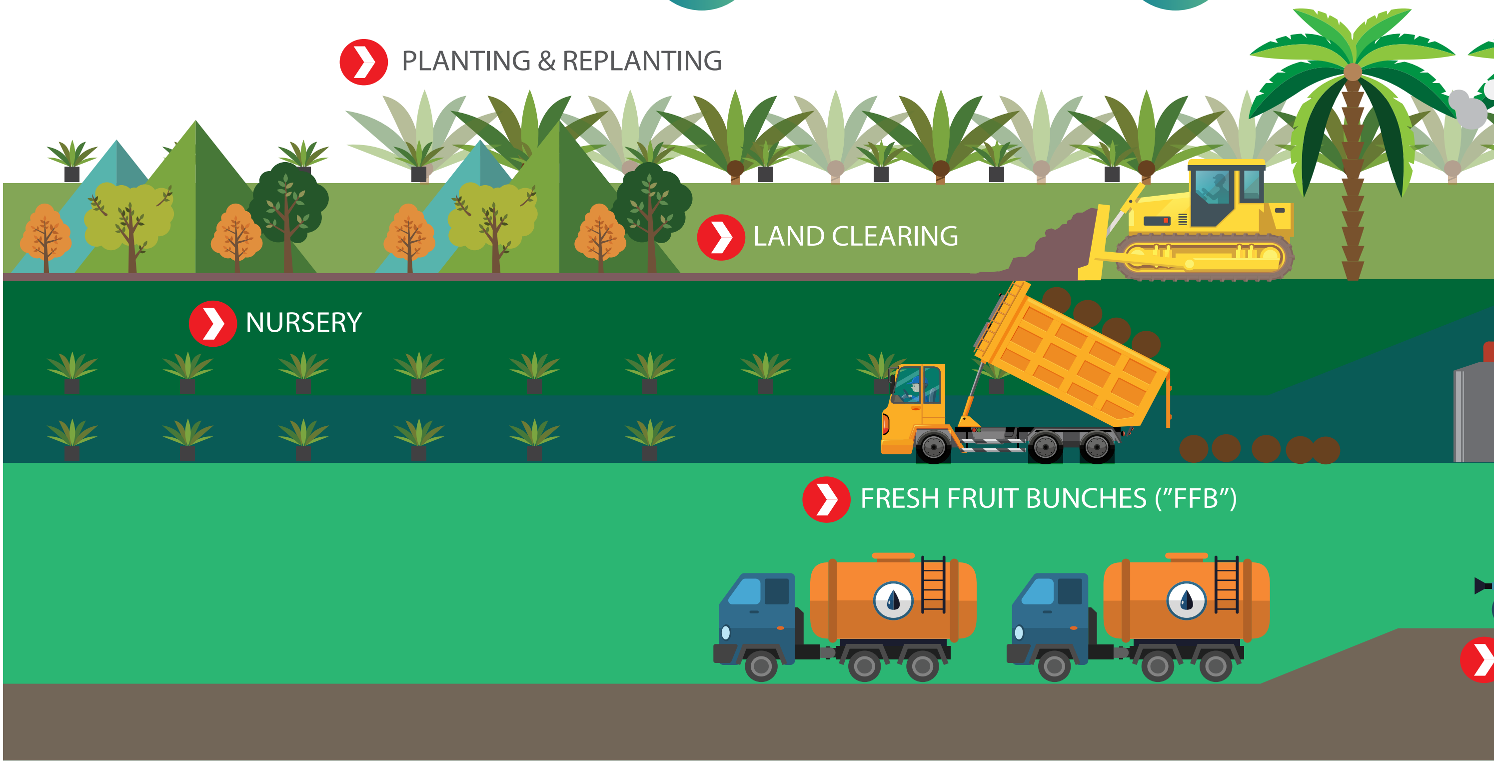
ON TRACK

A minimum

50%

reduction in emissions from POME

ON TRACK

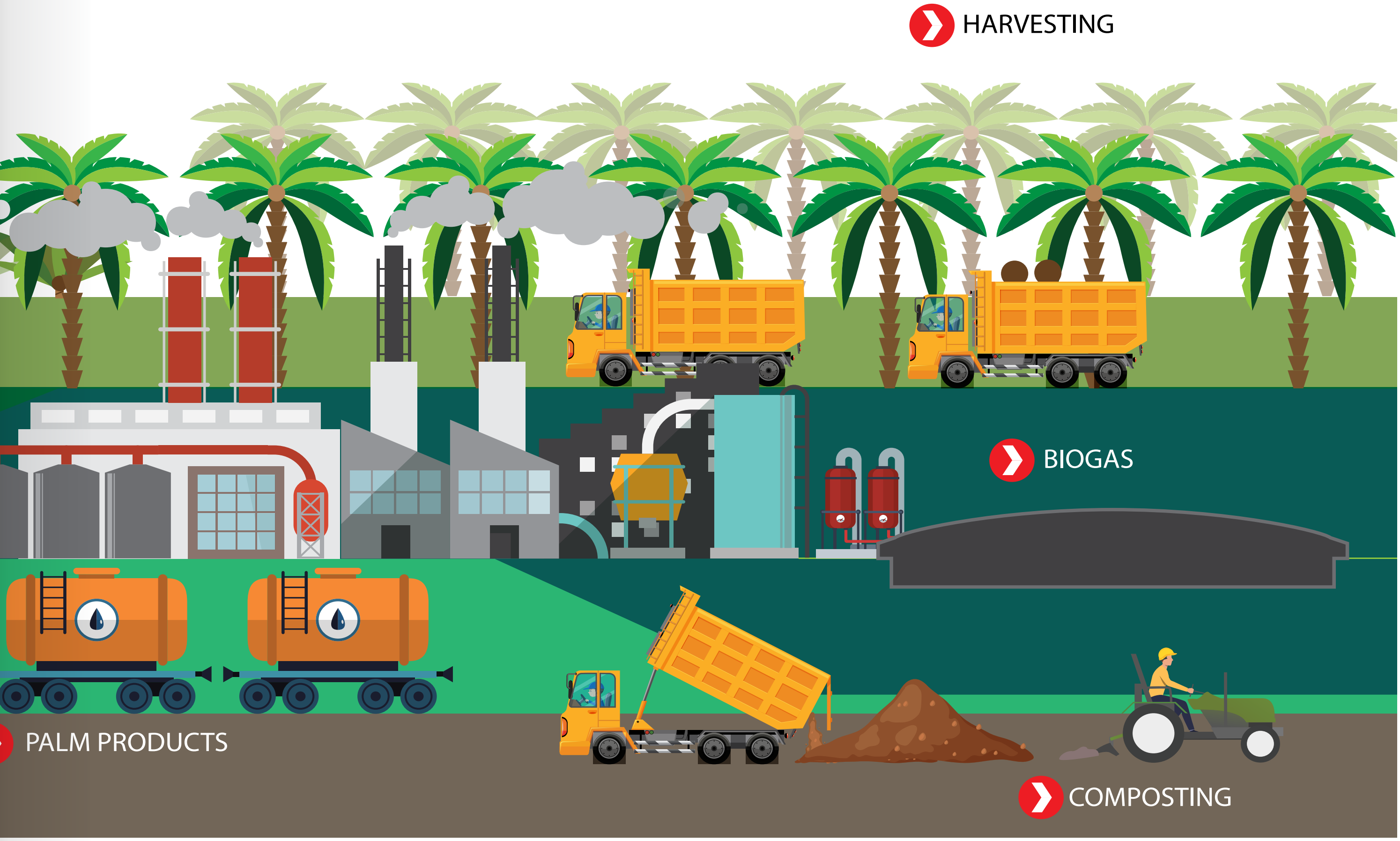


OUR GOALS BY 2025

50%

reduction in our carbon footprint by 2025

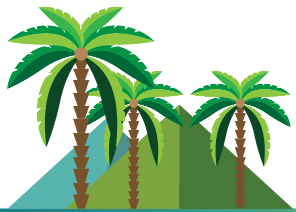
In light of the significant changes made to the PalmGHG methodology and greater certainty in our biogas capture plans, we have revised this target – set in 2014 – to be in line with our biogas-specific goals as it is largely determined by our POME emission mitigation initiatives.



02. ABOUT KULIM

5 RSPO

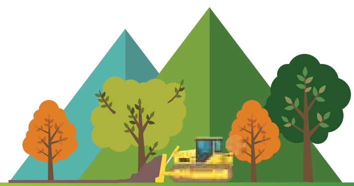
CERTIFIED MILLS



PLANTED

47,259

HECTARES



LANDBANKS

50,994

HECTARES

Kulim is a wholly owned subsidiary of Johor Corporation. Our Malaysian landbank covers 50,994 hectares across the states of Johor and Pahang in the southern part of Peninsular Malaysia, of which 47,259 hectares are planted with oil palm. In total, our Malaysian operations produced 306,483 tonnes of CPO and 78,994 tonnes of PK in 2018.

We began planting in our Indonesian operations in 2014, having acquired 74% ownership equity in PT Wisesa Inspirasi Nusantara ("PT WIN") along with holding rights to more than 40,650 hectares of potential palm oil land in Central Kalimantan. We subsequently completed the disposal of PT WIN on 28 December 2017 as part of our investment rationalisation plan.

Kulim completed the acquisition of PT Tempirai Palm Resources ("PT TPR") and PT Rambang Agro Jaya ("PT RAJ") in June 2016, gaining 8,345 hectares of oil palm planted area in South Sumatera. Rehabilitation programmes have recently been concluded at these estates and time-bound plans are in place to achieve RSPO certification by 2023. However, as these operations are not fully established at the time of publication, this report covers only our operations in Malaysia.

A steadfast advocate for sustainable development, Kulim was one of the first palm oil producers to achieve certification under the Roundtable on Sustainable Palm Oil ("RSPO") standard. All five (5) of our mills are RSPO-certified. These facilities collectively processed 1,459,331 tonnes of Fresh Fruit Bunches ("FFB") in 2018, of which 407,886 tonnes or 28% were purchased from external smallholders and outgrowers. Almost all Kulim plantations were established between 1970 and 1990 on land converted from other agricultural crops, particularly rubber. Only 1,360 hectares of our planted area is on peat, where best management practices are applied.

We revised our Sustainability Policy on 1st of May 2018 with stronger commitments to No Deforestation, No Peat and No Exploitation ("NDPE"). These include no new developments in areas of primary forest classified as High Carbon Stock ("HCS"), in areas containing one or more High Conservation Value ("HCV"), and in peat areas regardless of depth.

Location of estates and mills

03. OVERVIEW

Climate change is one of the most serious threats ever faced by humankind. It brings complex environmental, social and economic consequences that are already impacting our company, our supply chain partners, global and regional food security, and rural communities in areas vulnerable to natural disasters. Preventing or mitigating these devastating effects will require positive action on the part of every country, company and individual. This is why Kulim supports the Government of Malaysia's Intended Nationally Determined Contribution ("INDC") to the United Nations Framework Convention on Climate Change ("UNFCCC") of achieving a 45% reduction in greenhouse gas ("GHG") emission intensity by 2030 (Ministry of Energy, Science, Technology, Environment & Climate Change, 2016).

As part of our ongoing efforts to measure our progress towards this commitment, we present the fourth biennial Kulim Carbon Footprint Report. The following pages provide an overview of our climate change impacts, as well as the carbon footprint of the CPO and PK produced at our Malaysian mills.

REPORTING TOOLS

Kulim was one of the first companies to use the PalmGHG Calculator, a tool developed by the RSPO's GHG Working Group 2 to help oil palm growers estimate and monitor their GHG emissions and identify reduction opportunities.

The formula behind the PalmGHG Calculator has been updated several times since the launch of Version 1 in 2012. Version 2.1.1 ("V2") was released in 2014 with significant changes to the categorisation of previous land use and default values. A further update to Version 3 ("V3") in 2016 brought additional changes in default values. The latest iteration of the tool, PalmGHG Version 4 ("V4"), was released in December 2018 with a 12-month transition period.

To benchmark against peers, and to ensure comparability with GHG emissions data from previous years, we have used PalmGHG V3 in this report. This has enabled us to make reliable data comparisons on our emissions performance from 2015 to 2018. Earlier methodological changes (particularly between V1 and V3) means that data from our 2012-2014 reporting period are not comparable.

EMISSIONS PERFORMANCE SUMMARY

Our net emissions have decreased by an average of 1.85% annually over the past four (4) years – from just over 421,000 MT CO_2e in 2015 to 390,000 MT CO_2e in 2018.

Our carbon footprint per tonne of product also trended down over the same period, from 1.13 MT CO_2e in 2015 to 1.01 MT CO_2e in 2018. This represents a 42.5% reduction from our 2012 base year figure of 1.76[1] MT CO_2e per MT CPO/PK.

Carbon footprint per tonne of product (MT CO_2e per MT CPO/PK)

YEAR	KULIM	Palong	Sedenak	Sindora	Tereh	P. Panjang
2015	1.13[2]	1.07	1.35	0.99	0.90	1.22
2016	1.23	1.09	1.32	1.30	1.37	0.82
2017	1.08	0.97	1.37	1.16	1.05	0.76
2018	1.01	1.02	1.27	1.12	0.85	0.62

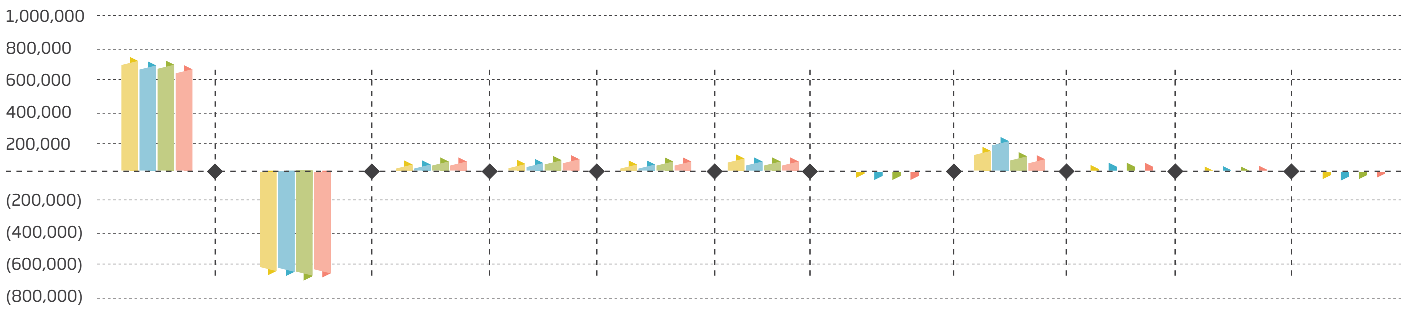
1 *Carbon footprint for base year of 2012 has been revised from 1.26 to 1.76 MT CO_2e per MT CPO/PK using V3 of the PalmGHG calculator.*
2 *This figure was incorrectly stated in the Carbon Footprint Report 2016 and has been restated in this report.*

The gas engine facilities that combust methane to generate electricity at Sindora Palm Oil Mill

03. Overview

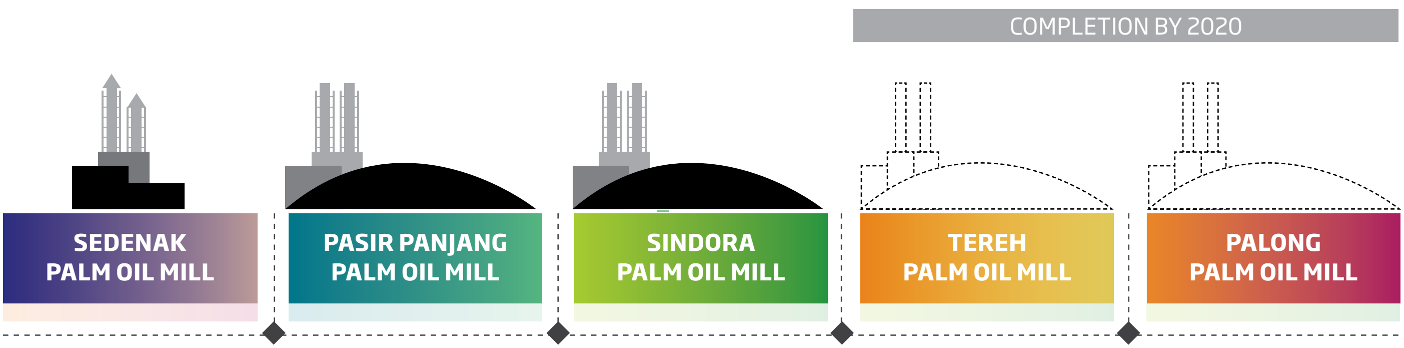
Historical land use change is by far the largest contributor to Kulim's GHG emissions. As most of our planted area has been converted from other agricultural crops with similar emissions profiles (mainly rubber), the sequestration associated with oil palm planting has largely balanced out these emissions. This has resulted in net planting emissions of just below 57,000 MT CO_2e for 2018.

GHG EMISSIONS FOR KULIM'S MALAYSIAN OPERATIONS INCLUDING SMALLHOLDERS 2015-2018 (MT CO_2e)



	Land Clearing	Crop Sequestration	Fertilisers	N_2O	Field Fuel Use	Peat	Conservation	POME	Mill Fuel Use	Grid Emissions	Mill Credit
2015	756,867	(656,079)	21,869	38,382	22,200	75,083	(3,247)	191,017	3,173	269	(28,406)
2016	734,449	(667,826)	22,205	44,907	19,608	74,292	(3,366)	227,198	3,030	320	(32,932)
2017	756,518	(690,397)	48,159	60,505	16,445	74,292	(3,410)	175,592	3,445	315	(32,208)
2018	729,751	(672,087)	55,738	65,672	19,417	74,292	(4,261)	145,492	3,382	310	(27,809)

Methane (CH_4) released by Palm Oil Mill Effluent ("POME") accounts for just over 145,000 MT CO_2e (37.3%) of our 2018 net GHG emissions. Methane capture facilities are now operational at three (3) of our mills – Sedenak, Pasir Panjang and Sindora. The latter two (2) facilities came online in 2017 and are already delivering significant reductions in emissions from POME sources.



With our sights set firmly on our target to achieve an overall 50% reduction in POME emissions by the end of 2025 (from a 2012 baseline), we have approved investments for methane capture facilities at two (2) further mills: Palong Cocoa Palm Oil Mill and Tereh Palm Oil Mill. Construction is scheduled to begin in 2019 and both facilities are targeted to be operational in 2020.

Emissions resulting from peat oxidation remained stable at around 74,000 MT CO_2e and having committed to zero development on peat, we anticipate no future increase. Emissions attributable to fertiliser use and the resulting nitrous oxide (N_2O) contributed 121,000 MT CO_2e. This figure has trended upwards over the last four (4) years as a result of changes in the types of fertiliser used across our estates. Emissions derived from fuel consumption at mills and in the field are within the expected range and remain comparatively low at around 22,800 MT CO_2e.

Construction of Tereh Palm Oil Mill Biogas Plant

03. Overview

EMISSIONS SOURCES AND EMISSIONS SINKS

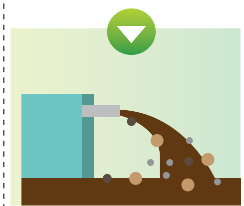
Land clearing release stored carbon in the biomass. The level of emissions depends on the type of previous land use, with high levels of forest cover, such as primary forest releasing high levels of CO_2, whereas grassland releasing only small amounts.

Fertiliser transport and use of fertilisers.

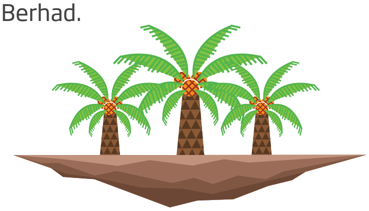
Field fuel use due to harvesting and collection of FFB. Diesel and gasoline combustion is a source of CO_2 emissions.

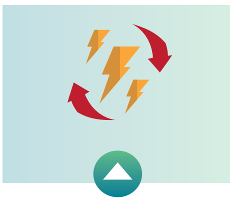
Mill diesel usage - fuel combustion is a source of CO_2.

Palm Oil Mill Effluent release methane, which is a powerful greenhouse gas.

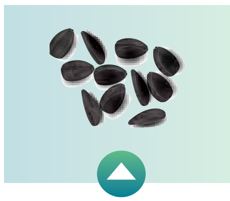


Peatland cultivation - these represent a significant source of GHG emissions. We have a small portion of peat within the cultivated area - 1,360 hectares (slightly over 1% of our cultivated land). This land was cultivated in 1999 - 2002 and the total area has changed due to land acquisition by Tenaga Nasional Berhad.

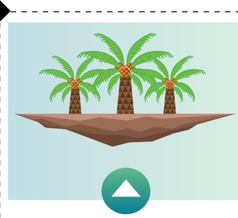




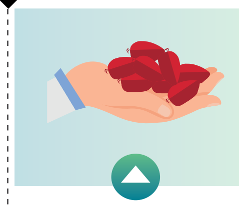
Biogass offset: Methane from Palm Oil Mill Effluent is captured and can be used for electricity or other energy usage, avoiding emissions.



Palm Kernel Shell ("PKS") sales: PKS sold externally and used as a replacement for fossil fuels can be offset as it reduces emissions.

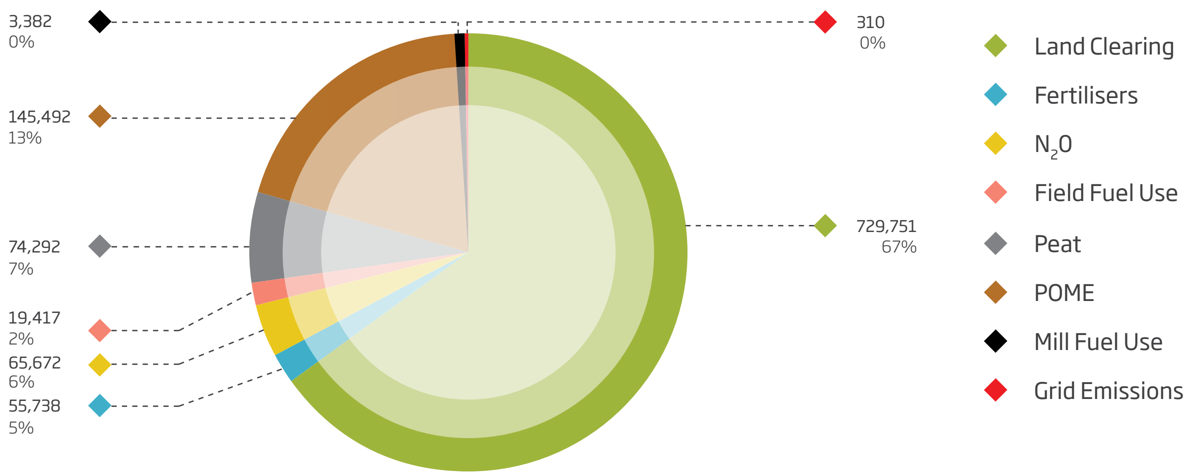


Carbon sequestration in the palm biomass. Oil palm can act as a 'sink' which fixes carbon and prevents emissions into the atmosphere.



Mill fuel offset - most power generation in the mill is based on biomass (shell and fibre) with only a small volume of diesel used for back-up generators. This leads to avoided emissions and can be offset.

GROSS CARBON EMISSIONS BY SOURCE (MT CO_2e)



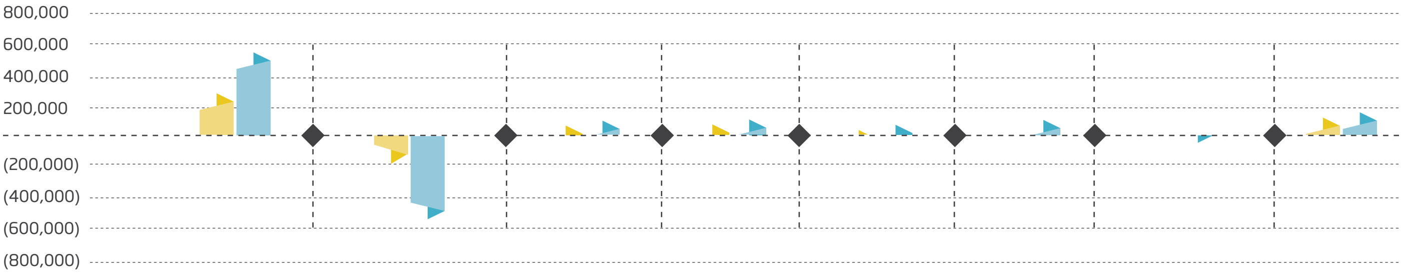
EMISSIONS FROM OIL PALM CULTIVATION

Land clearing and crop sequestration

Approximately 67% of our gross carbon emissions for 2018 resulted from land clearing, releasing a total of 729,751 MT CO_2e, inclusive of outgrower emissions. The main factor influencing these emissions is the replanting of oil palm in minor areas converted from rubber, sentang *(Azadirachta excelsa)* and arable crop cultivation. There has been no conversion from non-agricultural land in our Malaysian operations in either 2017 or 2018.

The amount of carbon released through land clearing has been offset by the amount of carbon sequestered through our planting of oil palms. Carbon sequestration accounted for 672,087 MT CO_2e in 2018, resulting in net GHG emissions of 57,664 MT CO_2e from land use. This 43% drop from a 2015 peak of 100,788 MT CO_2e was expected, as replanted oil palms sequester increasing amounts of CO_2 as they mature.

FIELD EMISSIONS INCLUDING OUTGROWERS 2018 (MT CO_2e)



	Land Clearing	Crop Sequestratation	Fertilisers	N_2O	Field Fuel Use	Peat	Conservation Credit	Total
Outgrowers (MT CO_2e)	218,064	(177,827)	4,424	3,196	5,286	-	-	53,144
Own Crop (MT CO_2e)	511,687	(494,260)	51,131	62,475	14,130	74,292	(4,261)	215,376

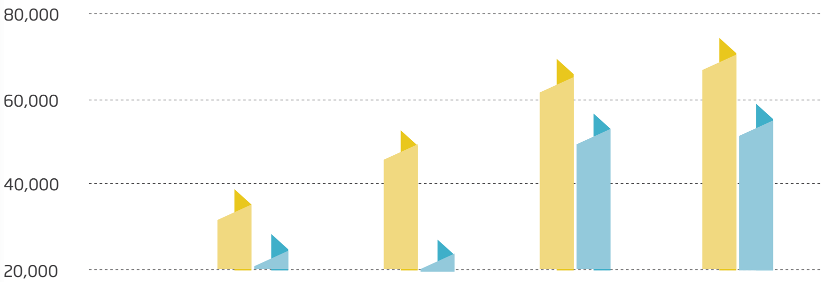
Fertiliser use and nitrous oxide ("N_2O") emissions

GHG emissions, particularly N_2O, are generated through the production, transportation and application of fertilisers across our own estates and in those belonging to our outgrowers. Fertiliser use contributed 121,409 MT CO_2e or 31.1% of our net GHG emissions in 2018, representing a 100% increase from 60,250 MT CO_2e in 2015.

In 2016, at the recommendation of Kulim's R&D and agronomy departments, our plantation division began applying reformulated compound fertilisers that best suit the current age profile of our oil palms. Despite applying similar amounts of fertilisers to previous years during the reporting period, the emission contribution from compound fertilisers as estimated by the PalmGHG Calculator increased markedly.

While this may seem at odds with our overall goal of reducing GHG emissions, improving the productivity of existing palm oil plantations through better nutrient management, seeds, and harvesting practices is a pragmatic way to address the conflict between the increasing global demand for palm oil and halting expansion of oil palm plantations (Walker, 2018). We have recorded an improvement in yield from 15.84 tonnes to 16.83 tonnes of FFB per hectare between 2015 and 2018.

FERTILISER EMISSION INCLUDING OUTGROWERS (MT CO_2e)



	2015	2016	2017	2018
N_2O	38,382	44,907	60,505	65,672
Fertiliser	21,869	22,205	48,159	55,738

03. Overview

The amount of CO_2e emitted by each chemical component in a fertiliser can vary widely, from 44 kg to 2,380 kg CO_2e per MT of fertiliser used (refer table). We calculate N_2O emissions derived from fertiliser by multiplying the nitrogen content by a factor of 44/28 (Chase L.D.C., 2012)[3].

CO_2e default values by fertiliser component

Fertiliser production	Material kg CO_2e/MT
Ammonium Nitrate (AN)	2,380
Diammonium Phosphate (DAP)	460
Ground Magnesium Limestone (GML)	547
Ground Rock Phosphate (GRP)	44
Kieserite	200
Muriate of Potash (MOP)	200
Sulphate of Ammonia (SOA)	340
Triple Superphosphate (TSP)	170
Ammonium Chloride (AC)	1,040
Urea	1,340

Field fuel use

We use fossil fuels mainly diesel to power equipment, vehicles and machinery in our field operations. This includes fuel consumed for the transportation of materials and workers, field maintenance, and for fertiliser application and FFB harvesting. In total, our consumption of fossil fuels for these purposes contributed only 4.98% of our net GHG emissions for 2018. The emissions factor for diesel use is 3.12kg CO_2e per litre.

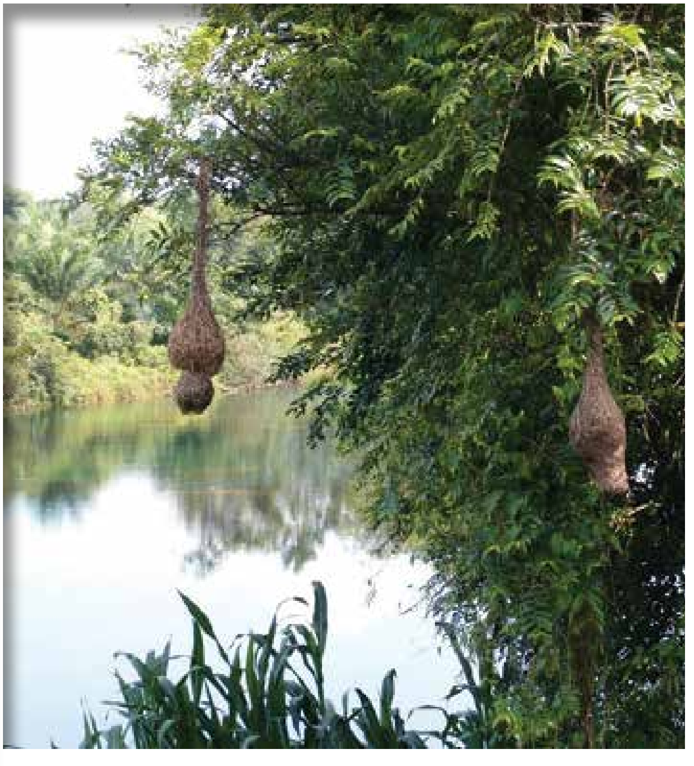
Plantings on peatland

Peatland are natural and significant stores of carbon that have accumulated over millennia. When disturbed, for instance by oil palm cultivation, this stored organic carbon is exposed and starts to decompose. This releases GHGs, including CH_4 and N_2O, into the atmosphere. While there remains significant uncertainty as to the factors that determine the magnitude of these emissions, drainage depth, subsidence and plantation age are all likely to play a role.

[3] *Calculation is based on the conversion of N_2O (molecular wt. 44) to N_2 (molecular wt. 28).*

Peatland make up only 1.2% of the land cleared and cultivated in Kulim estates and by our outgrowers. However, peat has a very high emissions factor and therefore makes a significant contribution to our overall carbon footprint. In 2018, peat-related emissions totalled 74,292 MT CO_2e, or 19.1% of our net emissions.

In compliance with RSPO Principles and Criteria, we have implemented best management practices to stabilise peat emissions. These include actively monitoring and controlling water tables with a drainage depth of 60 cm. To determine GHG emissions from peatland, we use default emission values of 0.91 MT CO_2e per cm per year (or 54.6 MT CO_2e per hectare per year where drainage depth is 60 cm) and 16 kg N-N_2O per hectare per year, as proposed by the PalmGHG calculator.



Carbon sequestration in conservation areas

Capturing and storing atmospheric carbon in biomass has been proposed as an effective way to both mitigate and decelerate the accumulation of GHGs in the atmosphere.

At Kulim, we include the portion of our landbank that we have set aside for conservation in our carbon sequestration calculations. As at end 2018, we have successfully established 1,053.65 hectares of set-aside land, reducing our overall carbon footprint by 4,261 MT CO_2e.

EMISSIONS FROM PALM OIL PRODUCTION

CO_2e emissions deriving from the processing of FFB into CPO at our mills remain our greatest modifiable source of GHGs. There are two main (2) emission sources at mill level: methane from POME and fuel for mill use. While POME remains a significant factor for mill emissions, fuel for mill use is insignificant for Kulim, as most of our operations are powered by biomass. Only 0.3% of our total emissions for 2018 derived from the use of diesel to power machinery.

03. Overview

Palm Oil Mill Effluent ("POME") methane emissions

POME is a wastewater produced during palm oil milling activities and it accounts for 98% of our total mill emissions. We are therefore pleased to report that POME-related emissions at our mills have decreased 36% from a peak in 2016.

Mitigating GHG emissions from POME – particularly methane (CH_4) – has been a central focus at Kulim ever since we began tracking our carbon footprint and climate change impacts. POME is a very good source for biomethane production and exploring gas-to-energy solutions has been key to our emissions reduction strategy.

In recent years, however, the operating environment for energy-generating methane capture facilities has undergone significant changes. The rise and fall of Carbon Emission Reduction ("CER") units under the Clean Development Mechanism ("CDM") framework and increasingly scarce Feed-In Tariff ("FIT") mechanisms, have all called the financial viability of such projects into question.

Despite these uncertainties, we believe that the direct and indirect impacts of inaction far outweigh the cost of developing such facilities. We are therefore pleased to communicate to our stakeholders that Kulim's management has approved investments to install methane capture facilities at all our remaining palm oil mills. This puts us well on track to achieve our target of having fully operational biogas capture facilities at 100% of Kulim mills by 2025.

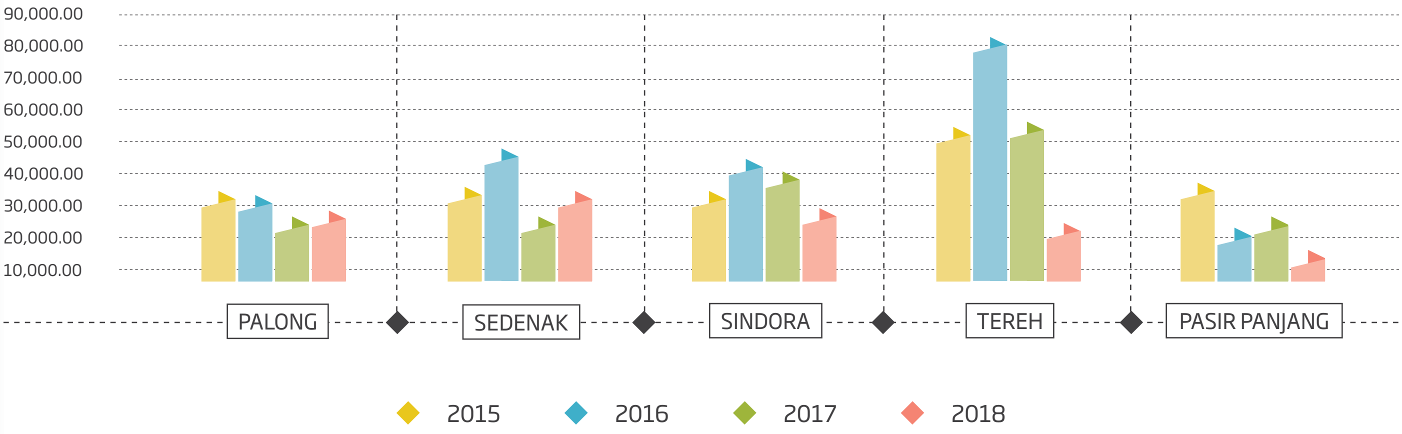
Our existing fully operational biogas facilities, together with other POME treatment measures including tertiary treatment plants, multi-disc screw press sludge dewatering systems, are already delivering results.

Compared to 2016, emissions at:

SEDENAK PALM OIL MILL	PASIR PANJANG PALM OIL MILL	SINDORA PALM OIL MILL
DECREASED BY	DECREASED BY	DECREASED BY
15,000 MT CO_2e	12,740 MT CO_2e	12,433 MT CO_2e
to 33,880 MT CO_2e	to 8,890 MT CO_2e	to 31,090 MT CO_2e

Methane capture facilities in Tereh Palm Oil Mill and Palong Cocoa Palm Oil mill are scheduled for construction in 2019 and commissioning in 2020.

POME EMISSIONS BY MILLS (MT CO_2e)



Emissions credit from palm kernel shell ("PKS")

PKS is a by-product derived from the production of CPO and PKO. It is currently used for power generation at our own mills or sold for external use. In 2018, we sold 12,216 MT of PKS produced at our mills to third parties.

Repurposing PKS in this way gives companies and countries a means to generate carbon offsets, or "carbon credits", as it replaces coal and other fossil fuels. PKS is in high demand in countries such as Japan and South Korea, where it is used for both energy generation and cement production.

Having monitored PKS usage since 2014, we have concluded that most of the PKS we sell is used for energy generation. We are therefore able to incorporate a carbon credit of 26,786 MT CO_2e for 2018. This exceeds our total combined emissions from fossil fuels consumed at mills and in field operations that year.

04. MITIGATION STRATEGIES AND REDUCTION TARGETS

METHANE CAPTURE AND BIOGAS GENERATION

As at 31 December 2018 we have three (3) biogas plants installed and fully operational at Kulim palm oil mills.

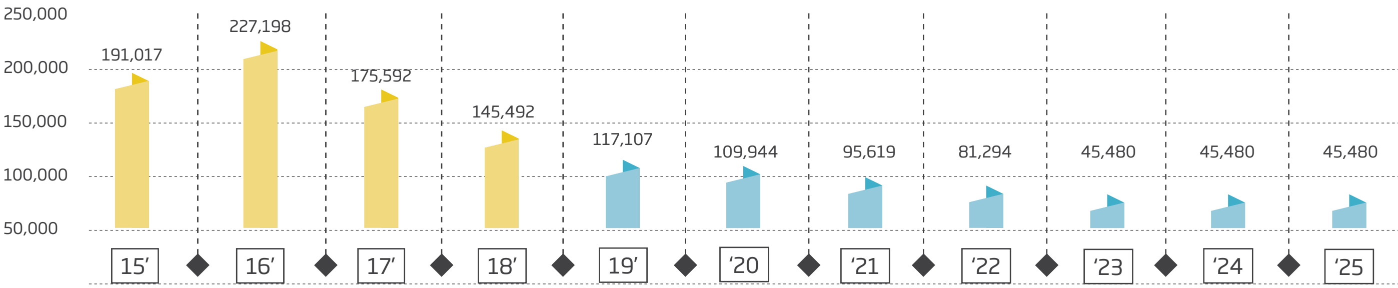
Commissioned in April 2014, our first methane capture and power generation project in Sedenak Palm Oil Mill is now capturing around 30% of the methane generated by the mill each year. The facility produced a total of 246,907 cubic metres of methane biogas for power generation and flaring in 2018, with the engine clocking 386 hours of operation. We have also been approached by a third party with a proposal to harvest the remaining methane generated for conversion to Bio-Compressed Natural Gas (BioCNG), an increasingly important alternative fuel source.

We commissioned a second plant in Pasir Panjang Palm Oil Mill in 2016, and flaring commenced in March 2017. This plant can utilise 100% of the POME generated, and the recovered biogas is being channelled to the mill boiler. We recorded a total biogas production of 348,129 cubic metres of biogas in 2018.

The facility at Sindora Palm Oil Mill was commissioned in 2017 and has the capacity to capture around 30% of the methane emitted from POME. It has produced 455,989 cubic metres of biogas.

With management approval to invest in methane capture and biogas facilities for our two (2) remaining palm oil mills, to be completed by 2020, we are now well on track to achieve our target of achieving a minimum 50% reduction in POME emissions by 2025 (compared to our 2012 base year emissions of 218,802 MT CO_2e).

PROJECT EMISSIONS REDUCTION (MT CO_2e) FROM POME
Under Biogas Capture Initiative (Up To Year 2025)



REDUCING OUR RELIANCE ON SYNTHETIC FERTILISERS

We continue to manage the production, transportation and use of synthetic fertilisers as part of our efforts to reduce both our GHG emissions and our impact on the environment. As well as contributing to GHG emissions, synthetic fertilisers can lead to the pollution of rivers and underground water sources when used excessively.

The collection of field data is in place, and is already offering insights to help us understand the footprint left by these compounds, and to optimise our use of both organic and non-organic fertilisers. In addition, all Kulim mills have established composting projects to recycle nutrients from empty fruit bunches and POME back into the fields.

Emissions from fertiliser use represent the next best opportunity for mitigation (after methane capture). We are now undergoing a review of our fertiliser strategy, and will provide further updates in the next report.

OUTGROWER ENGAGEMENT

Independent FFB suppliers contribute more than 30% of Kulim's total carbon footprint, making them key stakeholders when it comes to reducing the environmental impact of our business. Seizing the opportunity, we initiated a long-term engagement process with all our outgrowers in 2012. This initiative has since scaled into a comprehensive programme to support independent operators in achieving RSPO certification.

To date, two (2) outgrower groups have achieved full RSPO certification through this programme: Felda Paloh Estate and Ladang Wawasan. We continue to work with other groups, and we target to add Eng Lee Heng to the list of RSPO certified outgrower groups by the end of 2019.

We believe that by driving the adoption of good agricultural practices, including the efficient use of fertilisers, these certification schemes will enable sustainable reductions in GHG emissions across our supply chain.

UPDATED EMISSION REDUCTION TARGETS

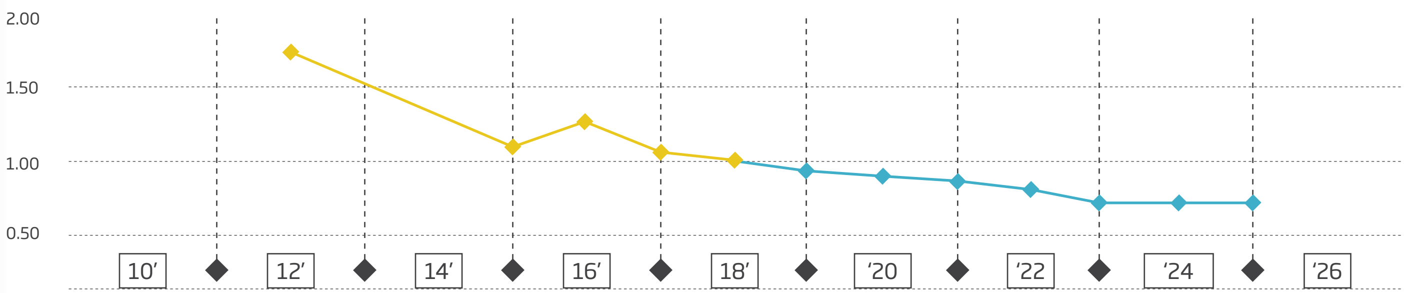
Kulim's current GHG emissions target, published in our 2014 Carbon Footprint Report, was to achieve a 58% reduction in our overall carbon emissions by 2020. This target was primarily based on the forecasted mitigation from our biogas initiatives, with the assumption that our biogas programme would be fully operational by 2020. It also assumed that the default values for land use change in the RSPO PalmGHG methodology would remain stable.

Following the postponement of some of our biogas capture projects, and in light of the significant changes to the PalmGHG Calculator methodology and default values, we have set a revised target to achieve a 50% reduction in our carbon footprint by 2025.

This target is based on a recalculated base year carbon footprint using PalmGHG V3 to ensure consistency as recommended by the GHG Protocol Corporate Accounting and Reporting Standard. The target date was also moved forward to 2025 to be in line with the specific targets set for our biogas plans, as the overall carbon footprint is largely dependent on the outcomes of our biogas initiatives.

Despite falling short of our 58% reduction target, we are nevertheless pleased to report that this year we have achieved the smallest product carbon footprint of 1.01 MT CO_2e for every MT of CPO/PK produced by Kulim to date, and expect further reductions in the years to come.

PRODUCT CARBON FOOTPRINT PROJECTION (2015-2025)



(* Assuming all other GHG emissions remains constant as of 2018)

05. METHODOLOGY

PALMGHG CALCULATOR

All calculations and definitions applied in this report are based on the PalmGHG Calculator developed by the RSPO Greenhouse Working Group 2, unless stated otherwise. This version of the tool is in turn based on the Global Warming Potential Assessment of Palm Oil Production ("GWAPP") model developed by Chase and Henson (2010).

The PalmGHG Calculator was developed to highlight GHG emission "hotspots" in the palm oil production chain. It enables palm oil producers to monitor their GHG emissions, identify reduction opportunities and develop reduction plans.

GHG emissions sources listed under the PalmGHG framework include

- Land clearing.
- Production and transport of fertiliser.
- N_2O and CO_2 emissions from the application of fertilisers in the field.
- Use of fossil fuels in plantations for planting work and FFB harvesting, collection and transport to mills.
- Use of fossil fuels in mill operations.
- Emissions of CH_4 from the anaerobic degradation of POME from mills.
- CO_2 and N_2O emissions from cultivation on peat soil.

GHG fixation and credits listed in the PalmGHG framework include

- CO_2 fixation by the growth of palm trees.
- CO_2 fixation by biomass in conservation areas.
- GHG emissions avoidance from the use of by-products, such as palm kernel shells, as well as the use of electricity generated by biomass from the mills.

GHG emissions sources/sinks excluded in the PalmGHG Calculator are

- Nursery planting stage.
- Pesticide: manufacturing, transport and use.
- Fossil fuel use during land clearing activities.
- Carbon footprint of infrastructure, plant and equipment.
- Carbon sequestration in palm end-products.
- Work-related employee travels and commuting.

POME from biogas plant anaerobic pond will further treated in this polishing plant prior to land application

ASSUMPTIONS OF THE PALMGHG FRAMEWORK

The PalmGHG tool provides a set of default values for use where company-specific field data is unavailable. In this report, we use Kulim's own field data wherever they are available and can be verified by our operational records.

Elsewhere, default values are used to determine GHG emissions from land use change, peat emissions, as well as the production and field application of fertiliser. Several emission factors were also based on PalmGHG default values, including for POME conversion to methane and fossil fuel and grid electricity offsets.

ASSUMPTIONS FOR CARBON REDUCTION TARGETS

All projections and forward-looking statements relating to goals and targets assume that:

- Once a biogas facility is operational, 10% of POME will be diverted to the facility in the first year, 30% in the second year, 50% in the third year and 100% from the fourth year onwards.
- All mills will have biogas plant installed by 2019.
- All other emissions remain constant over the period.

Carbon footprint for base year of 2012 has been revised from 1.26 MT CO_2e per MT CPO/PK to 1.76 MT CO_2e per MT CPO/PK using V3 of the PalmGHG calculator.

To ensure a conservative estimate, we assume that all biogas generated will be flared and not used to generate electricity in mills (which would create a greater carbon offset). All other data, including FFB throughput, land clearing and sources of emissions and sequestration, are assumed to remain at 2018 conditions.

06. BASE DATA

Emissions data 2018 (PalmGHG Version 3)

DESCRIPTION	UNIT	PALONG COCOA PALM OIL MILL	SEDENAK PALM OIL MILL	SINDORA PALM OIL MILL	TEREH PALM OIL MILL	PASIR PANJANG PALM OIL MILL
Crude Palm Oil	MT CO_2e/ MT CPO	1.01				
		1.02	1.27	1.12	0.85	0.62
Palm Kernel	MT CO_2e/ MT PK	1.01				
		1.02	1.27	1.12	0.85	0.62
Net Emission	MT CO_2e/yr	51924.43	154290.48	70847.18	74262.63	38569.9
Land Clearing	MT CO_2e/yr	91442.2	237736.51	130734	146003.4	123834.5
Crop Sequestration	MT CO_2e/yr	(86523.75)	(216519.52)	(109454.57)	(140657.48)	(118931.49)
Fertiliser Production & Transport	MT CO_2e/yr	9639.36	10150.47	9714.09	13730.56	12503.03
Fertiliser Application (N_2O)	MT CO_2e/yr	10184.76	20181.64	10371.09	14199.46	10734.77
Field Fuel Use	MT CO_2e/yr	1077.11	5931.8	1942.46	5471.84	4993.34
Peat Land Emissions	MT CO_2e/yr	-	74292.04	-	-	-
Conservation Area Offset	MT CO_2e/yr	(234.82)	(36.57)	(50.83)	(422.5)	(3516.63)
Methane from POME	MT CO_2e/yr	29787.19	33881.82	31089.9	41839.66	8893.38
Mill Fuel Use	MT CO_2e/yr	242.93	1241.25	361.74	718.39	817.25
Grid Emission	MT CO_2e/yr	165	-	145	-	-
Mill Credit	MT CO_2e/yr	(3855.37)	(12568.96)	(4005.56)	(6620.7)	(758.25)
GHG Emission by FFB Source						
Own Crops	MT CO_2e/yr	25581.86	101917.02	20065.23	31451.48	29031.72
Group	MT CO_2e/yr	-	3630.33	292.16	2817.74	585.8
Outgrowers	MT CO_2e/yr	-	26189.02	22899.16	4056.06	-

Emissions data 2017 (PalmGHG Version 3)

DESCRIPTION	UNIT	PALONG COCOA PALM OIL MILL	SEDENAK PALM OIL MILL	SINDORA PALM OIL MILL	TEREH PALM OIL MILL	PASIR PANJANG PALM OIL MILL
Crude Palm Oil	MT CO_2e/ MT CPO	1.08				
		0.97	1.37	1.16	1.05	0.76
Palm Kernel	MT CO_2e/ MT PK	1.08				
		0.97	1.37	1.16	1.05	0.76
Net Emission	MT CO_2e/yr	51739.37	146091.85	72572.81	90940.48	47912.26
Land Clearing	MT CO_2e/yr	117675.41	247035.52	146645	135781.54	109380.54
Crop Sequestration	MT CO_2e/yr	(110962.5)	(226199.21)	(122095.33)	(126129.34)	(105010.16)
Fertiliser Production & Transport	MT CO_2e/yr	9750	10467.33	5507.6	13319.24	9114.48
Fertiliser Application (N_2O)	MT CO_2e/yr	10911.36	20335.35	6462.04	14062.58	8733.4
Field Fuel Use	MT CO_2e/yr	1137.44	7215.12	2971.27	2283.42	2838.09
Peat Land Emissions	MT CO_2e/yr	-	74292.04	-	-	-
Conservation Area Offset	MT CO_2e/yr	(239.78)	(307.55)	(14.15)	(364.79)	(2483.63)
Methane from POME	MT CO_2e/yr	26682.22	26330.51	39873.4	55698.31	27008.02
Mill Fuel Use	MT CO_2e/yr	277.36	1315.01	365.41	667.28	819.55
Grid Emission	MT CO_2e/yr	181	-	134	-	-
Mill Credit	MT CO_2e/yr	(3673.12)	(14392.27)	(7276.63)	(4377.76)	(2488.03)
GHG Emission by FFB Source						
Own Crops	MT CO_2e/yr	25701.67	105056.45	15746.41	34799.32	22572.72
Group	MT CO_2e/yr	-	2032.85	3.71	495.08	-
Outgrowers	MT CO_2e/yr	3412.2	25749.3	23727.19	3658.25	-

06. BASE DATA

Production data

DESCRIPTION	UNIT	2018	2017	2016	2015	2014
Palm Products						
Crude Palm Oil	MT CPO/yr	306,483	299,981	273,354	294,255	257,881
Palm Kernel	MT PK/yr	78,994	79,071	70,030	78,290	69,681
FFB Production						
Own Crop	MT FFB/yr	1,051,446	1,149,709	974,881	990,629	845,257
Outgrowers	MT FFB/yr	407,886	317,986	364,778	419,994	407,568
Planted Area						
Own Crop	Ha	53,470	56,204	56,097	55,935	55,976
Outgrowers	Ha	25,375	28,729	22,816	23,095	20,328
Fertiliser						
Own Crop	MT/yr	62,061	57,455	62,642	60,376	23,450
Outgrowers	MT/yr	6,608	5,268	7,671	5,925	5,941
Field Fuel Use						
Own Crop	liters/yr	4,596,450	5,078,590	2,960,339	4,439,149	4,904,199
Outgrowers	liters/yr	1,492,358	1,204,970	2,090,917	2,691,904	1,909,507
Mill Fuel Use	liters/yr	788,379	1,104,043	971,047	1,016,824	676,298

DATA COLLECTIONS AND LIMITATIONS

Two distinct data sets have been used in this report. Each set has associated challenges and scope for improvement.

In-house data from estates and mills

Primary emissions data from Kulim estates and mills were obtained from statistics and monitoring undertaken by our Estates and Engineering Departments. These data are assumed to have a high level of accuracy, although continuous efforts to increase robustness will be undertaken. Two particular areas have been identified for significant improvements: crop sequestration and peat emissions.

Crop sequestration

Our calculations to determine the amount of carbon sequestered by the planting of new palm trees are based on estimates using the default values provided in the PalmGHG calculator. These default values are recommended in the Calculator guidelines, and are obtained from the OPRODSIM and OPCABSIM models . Kulim does not presently have in place a system for making on-site measurements of the biomass growth of its own palm trees.

Peat emissions

While peat areas within Kulim-owned estates are actively monitored and controlled for water table levels, the same cannot be ascertained for outgrowers' operations. Kulim is in the process of identifying all outgrowers within our supply chain, and we will work with these parties to preserve peatlands from degradation.

Outgrower data

The second data set relates to our outgrowers' crops. Kulim's external crop is primarily purchased from third-party FFB traders who do not disclose the source of their FFB. In order to facilitate some level of monitoring, data were collected using interviews and questionnaires sent to FFB traders and smallholders. Kulim has assigned dedicated personnel to engage these stakeholders in the process. However, several factors contributing to a high margin of error have been identified:

Despite the shortcomings of the current formulation, we believe that this is still an improvement over the standard assumption that a company's FFB and externally sourced FFB have similar carbon profiles. Indeed, our calculations to date indicate that this is not the case. In addition, we believe that external FFB data can be improved over time as engagement with traders and external suppliers continues and levels of trust and transparency increase.

01 Diversity of suppliers

All the respondents replied and submitted the requested data. The data supplied indicate a vast difference between suppliers due to variations in previous land use profiles.

02 Insufficient record keeping

The quality of record keeping varies significantly and may lead to a high level of uncertainty. This includes records of previous land use over the past three decades and the identification of mineral soils versus peatlands.

03 Emissions from non-palm related activity

It is assumed that all the fertilisers and fuels purchased by smallholders and outgrowers are used for oil palm cultivation and harvesting activities. However, it is likely that these resources may also be used for other purposes, such as for the cultivation of additional crops or private transport. A more detailed methodology would therefore differentiate between resources used for palm and non-palm related activities.

07. GLOSSARY

Biogas is a mixture of methane and carbon dioxide produced by the bacterial decomposition of organic wastes. A renewable energy source, biogas, can be used as a fuel for vehicles or injected into the natural gas grid.

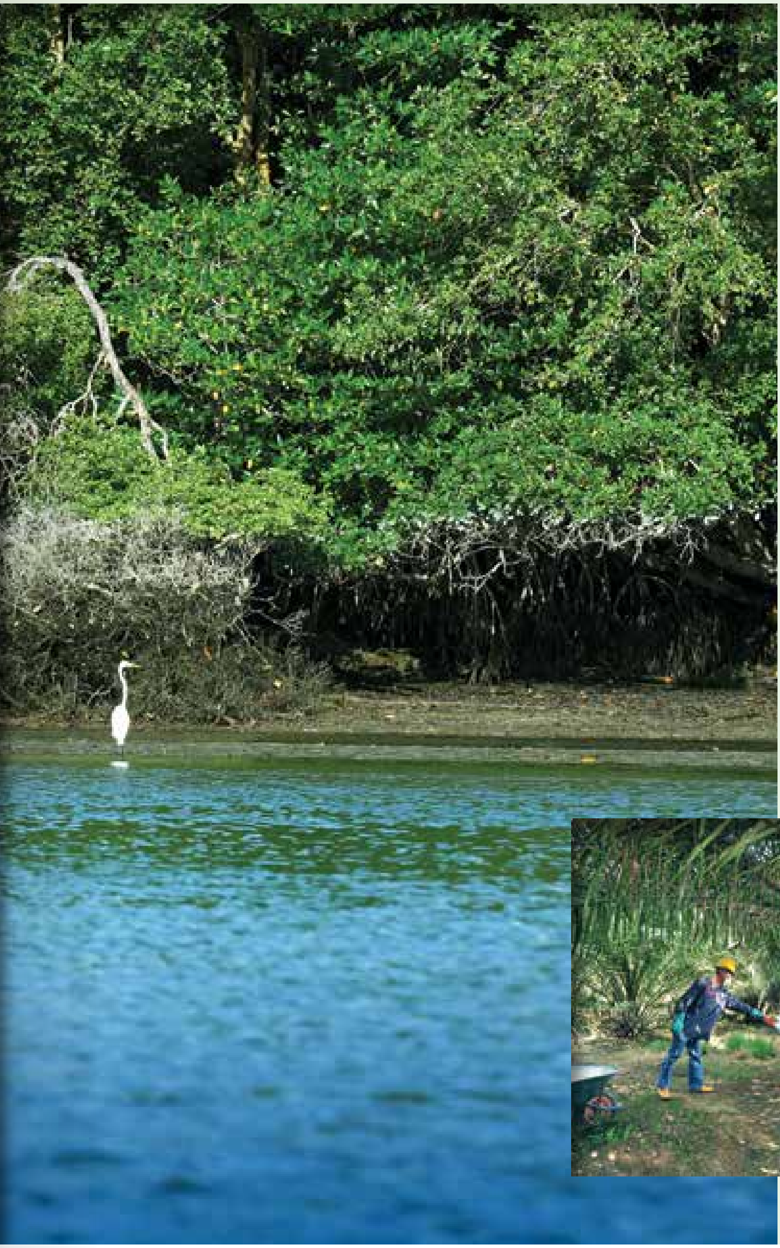
Biomass is biological material derived from living or recently living organisms. In the context of biomass for energy this is often used to mean plant-based material, but biomass can equally apply to material derived from both animal and vegetable sources.

Carbon dioxide (CO_2) is the most widespread greenhouse gas. CO_2 is released to the atmosphere through natural and human activities, including inter alia fossil fuel and biomass combustion, industrial processes, and changes to land use. Carbon dioxide accounts for 76.7% of global greenhouse gas emissions, with 13.5% arising from agriculture and 17.4% from forestry.

Carbon dioxide equivalent (CO_2e) is a unit of measurement used to compare the climate effects of different greenhouse gases. CO_2e is calculated by multiplying the quantity of a greenhouse gas by its global warming potential. The standard form of labelling emissions is therefore to express them as carbon dioxide equivalents or CO_2e.

Carbon footprint is the amount of carbon dioxide and other carbon compounds emitted through the activities of a particular person or group. Reports on these emissions for an operation or product are also referred to as carbon reports or carbon footprints.

Carbon sequestration (also carbon sink) describes the process by which vegetation captures carbon dioxide from the atmosphere through the process of photosynthesis, and releases oxygen and some carbon dioxide through respiration. Part of this carbon is retained in vegetation as biomass. Because around half of the biomass of a plant is carbon, as the plant grows and adds biomass it also adds or sequesters carbon. This is a natural process, but it can be enhanced – for example planting trees on previously unforested land will sequester more carbon because of the increase in biomass. The term 'sink' is used to mean any process, activity or mechanism that removes a greenhouse gas from the atmosphere.



Crude palm oil (CPO): A type of unrefined vegetable oil obtained from the fruit of the oil palm tree.

Fresh Fruit Bunch (FFB): Bunch harvested from the oil palm tree. Each bunch can weigh from 5 to 50 kilogrammes and can contain 1,500 or more individual fruits.

Greenhouse gases (GHGs) are an important part of the earth's natural cycle, keeping the planet warm enough to sustain life. Human activities are upsetting the balance by increasing the concentration of GHGs to the point where rising temperatures threaten livelihoods, ecosystems and economies. The major GHGs and their contribution to the greenhouse effect (rounded up) are water vapour (60%), carbon dioxide (26%), methane (5%), ozone (4%), fluorinated gases (4%), and nitrous oxide (2%).

Oil palm: A species of palm *(Elaeis guineensis)* and the principal source of palm oil. It is native to west and southwest Africa, but is now cultivated in over 26 countries. Ideal growing conditions occur up to 10 degrees either side of the equator.

Palm kernel (PK): The kernel or core of the oil palm fruit.

Palm products include versatile oil and fat products that can be used in a wide range of applications, from food manufacture and cosmetics, to biofuel and pharmaceuticals. Kulim (Malaysia) Berhad is a leading processor of Fresh Fruit Bunches ("FFB") and producer of Crude Palm Oil ("CPO") and Palm Kernel ("PK").

08. REFERENCES

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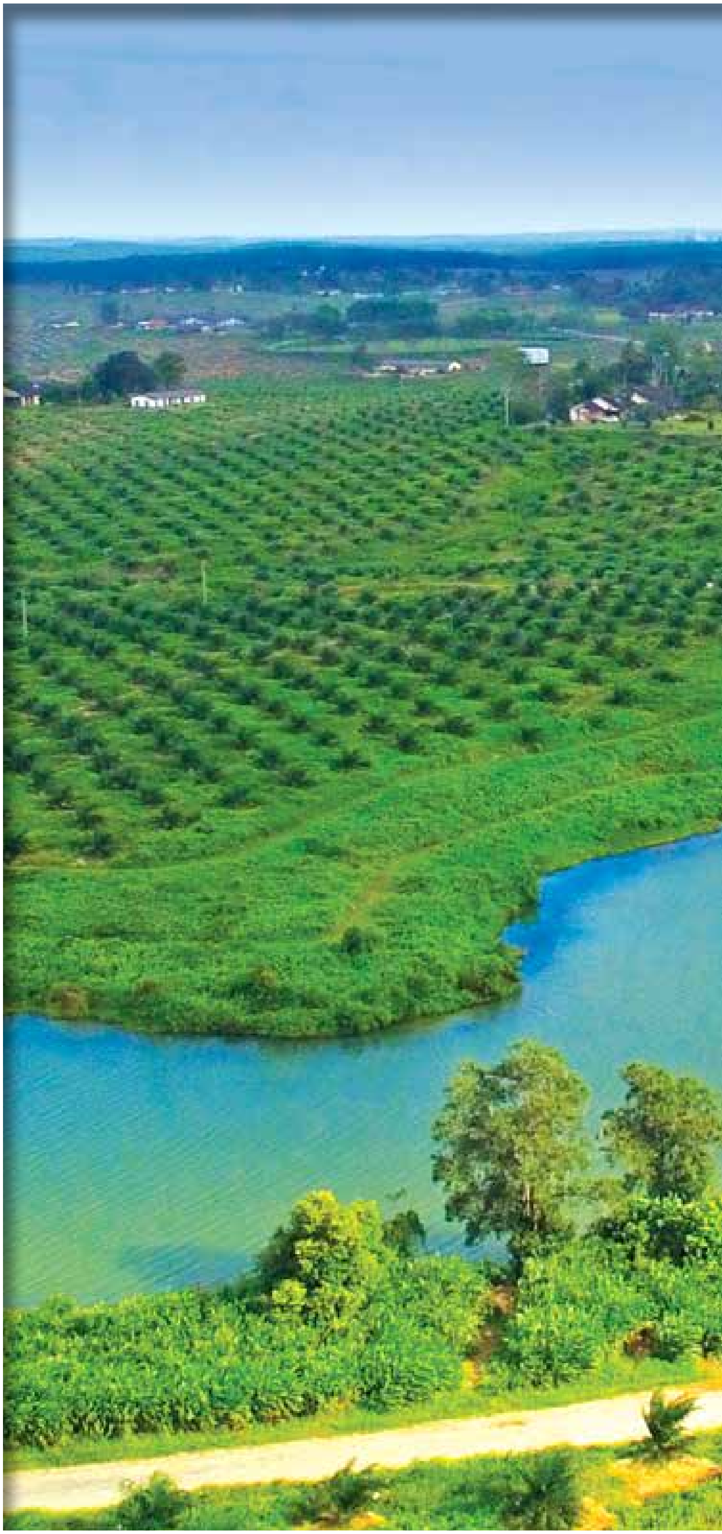

09. ABOUT THIS REPORT

This report covers Kulim's oil palm operations in Malaysia for the calendar years 2017 and 2018. Data, commitments and targets do not cover Kulim's operations in Indonesia, which were initiated in 2014. Since then, our landbank in Indonesia had undergone significant changes by way of disposals and acquisitions. Our operations in Indonesia have not yet been fully established at the time of reporting.

The data in this report are presented on a best-effort basis and may be subject to change. The data were collated in-house and screened and analysed by a third-party consultant from Helikonia Advisory Sdn. Bhd. The data have not been subject to independent verification or assurance.

We welcome feedback and questions. Please contact:

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