
Oil Palm Trunk - High Value Technology for Tropical Forest Conservation

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Dr. KOSUGI Akihiko currently works at JIRCAS as Project Leader of the "Asia Biomass" research. His area of study includes microbiology and biomass utilization. He received his Ph.D. in Applied Biology and Chemistry from Tokyo University of Agriculture in 2000. He worked as a postdoctoral fellow (Molecular & Cellular Biology) at the University of California, Davis, USA (2000-2003). He also worked as a researcher at Kaneka Corporation (2003-2005). He joined the Japan International Research Center for Agricultural Sciences (JIRCAS) in 2005. He has about 20 years of experience in collaborative research in Malaysia and Thailand. He is also a professor at the Graduate School of Life and Environmental Sciences at the University of Tsukuba.

ABSTRACT

Palm oil extracted from palm fruits is the most consumed vegetable oil in the world and is used as a raw material for producing cooking oil, margarine, and shortening. It accounts for about 30% of total vegetable oil production of 200 million tons. In Indonesia and Malaysia, where 80% of the world's palm oil is produced, approximately 3.6 million ha of tropical rainforest have been converted to oil palm plantations over the past 20 years, and there are substantial concerns about their impacts on the natural environment and ecosystems.

Oil palms are replanted when they reach an economic age (25-30 years after planting). In Indonesia and Malaysia, approximately 63 million oil palm trunks (OPTs) are felled annually, and reforestation is carried out in approximately 440,000 ha per year. The plantation is like a waste dump for biomass, leading to the failure of replantation due to the spread of pests. It also has a significant impact on the environment, causing greenhouse gas (GHG) emissions due to the decomposition of OPTs. New plantations need to be established to compensate for the failure of replantation, even as tropical forests are being cut down and disappearing at an alarming rate.

JIRCAS has developed a technological system that enables efficient production of renewable energy and chemical materials from OPTs through field surveys and research on OPT at a palm plantation in Malaysia. In 2019, we started the SATREPS project titled "Sustainable Replantation of Oil Palm by Adding Value to Oil Palm Trunk through Scientific and Technological Innovation."^[1] In this project, we are developing activities for dissemination and social implementation through the development of a technology for manufacturing high value-added products from OPT. Panasonic Housing Solutions Co., Ltd., a member of the project, has developed a technology to produce recycled OPT board for use in furniture and building materials with intermediate materials, and is moving toward manufacturing and marketing the product^[2]. In addition to reducing GHG emissions, this technology is expected to have several other positive effects, such as halting the destruction of forests, a source of CO₂ absorption, as a "new material that can replace wood," and creating new jobs in oil palm-producing countries.

The project members and JIRCAS will contribute to the protection of tropical forests through the sustainable management of palm plantations by adding value to OPT^[3].

[1] <https://satreps-opt.com/>

[2] <https://panasonic.co.jp/phs/technology/palmloop/>

[3] <https://sj.jst.go.jp/stories/2022/s0830-01j.html>

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Project leader
Akihiko KOSUGI, Ph.D.



Palm oil is an oil that everyone uses every day.



What is the palm oil issue?

- Competition with food
- Tropical rainforest logging
- Loss in biodiversity
- Land use conversion
- Water quality/Soil pollution

Oil Palm Trunk

1. Logging and renewal of OPT approximately every 25 years
2. Approximately 4,400 km² is logged each year. 75 million trees logged per year
3. 180 million tons per year (dry), including OPF, are not be utilized.

Characterization of OPT



樹液 (Sap)

ヨウ素デンプン反応 (Iodine starch reaction)

柔組織 (Parenchyma)

デンプン (Starch)

維管束 (Vascular Bundles)

Three problems of palm plantations

1. OPT has a high moisture content and has no resource value as wood and must be discarded.
2. Land management problems
Pest and disease damage/ Consecutive crop damage/ Soil degradation /Decrease in fruit yield
3. GHG emission from palm plantation

SATREPS-OPT project

Project title: Project on sustainable replantation of oil palm by adding value to oil palm trunk through scientific and technological innovation

National research project: April 2019 ~ Mar 2025 (6 years)



Project Leader
Akihiko KOSUGI

JIRCAS





Project Leader
Prof. Sudesh K Kumar

Universiti Sains Malaysia



Effects of OPT fiber residues on crops

OPT fiber residues are tested in crop cultivation tests to see how they affect plants.
(Uke et al. Journal of Environmental Management Vol 295, Open Access)



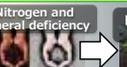
No added fiber



Fiber added

Increased amount of biomass-degrading microbes (fungus growth) Symptoms of plant physiological disorders (nitrogen and Mg deficiency)

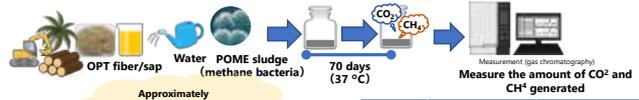




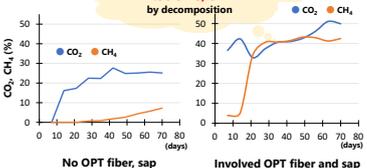


Estimates of greenhouse gas (GHG) emissions from OPT logging

When harvested oil palm fibers are left in the soil, how much GHG is emitted?
Predict how plantation management requires GHG emissions in different situations.



Approximately **1.3t GHG/OPT** by decomposition



	Estimated annual harvested OPT volume (10,000 tons/year)	GHG emissions from estimated annual logging OPT (billion tons/year)
Malaysia	7,500	0.98
Indonesia	15,000	1.96
Malaysia + Indonesia	22,500	2.94
Japan's GHG reduction target (from "Japan's National Intended Nationally Determined Contribution (government draft)" at COP21)		3.66



Panasonic Housing Solutions Co.

From the **PALM LOOP** special page, a technology for converting waste oil palm wood into recycled wood board



Developed the world's first technology for making recycled board from oil palm



Factors in Deforestation
The massive consumption of wood panels in Asia is another cause of deforestation.

(1,000 m³/年) Global Wood Materials Consumption by Application (2019)



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Developing global solutions to palm oil industry issues



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If you want to know more about our activities,

OPT Project home page
<https://satreps-opt.com/>

JIRCAS channel

JST news

Panasonic PALS LOOP
<https://panasonic.co.jp/iph/technology/palmloop/>

JIRCAS Dream Biomass Solutions Co. (JDBS)
<https://opt-jdbs.com/>

Thanks very much for your attention

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