KEYNOTE SPEECH

Prof. Mitsuru Osaki, Ph.D
President,
JAPAN PEATLAND SOCIETY (JPS)

TIME & PLACE

17 Feb. 2025, MONDAY
09:00 WIB or 11:00 JST
Meeting Hall (Aula Rahan), 2nd Floor UPR Rectorate Building - Palangka Raya, INDONESIA

COLLABORATED

- ✓ Japan Peatland Society (JPS), JAPAN
- ✓ Magister of Agricultural Science, Faculty of Agriculture (MIP) UPR, INDONESIA
- ✓ Department of Agrotechnology, Faculty of Agriculture UPR, INDONESIA
- ✓ Center for Development of Science, Technology and Peatland Innovation (PPIIG) UPR, INDONESIA

www.upr.ac.id upr.official humas.upr Humas UPR

Lecture
@ University of Palangka Raya
February 2025

“Peatlogy” on Tropical Peatland – Paradox & Solution-

Mitsuru OSAKI, Ph, D
Professor Emeritus, Hokkaido University
The President of Japan Peatland Society (JPS), Japan
Mail Adders: mosaki@agr.hokudai.ac.jp

Research.com ranking in the field of Plant Science and Agronomy in 2023
#11 in Japan
#668 in the world

What is “Peatlogy”?

Earth & Environment | Mitsuru Osaki

Peatlogy in tropical peatland

A new transdisciplinary science

Research Outreach Article: https://researchoutreach.org/articles/peatlogy-tropical-peatland-new-transdisciplinary-science/#:~:text=Peatlogy%20in%20tropical%20peatland%20offers,for%20eco%2Dmanagement%20and%20eco%2D

Behind the Research


Prof Mitsuru Osaki

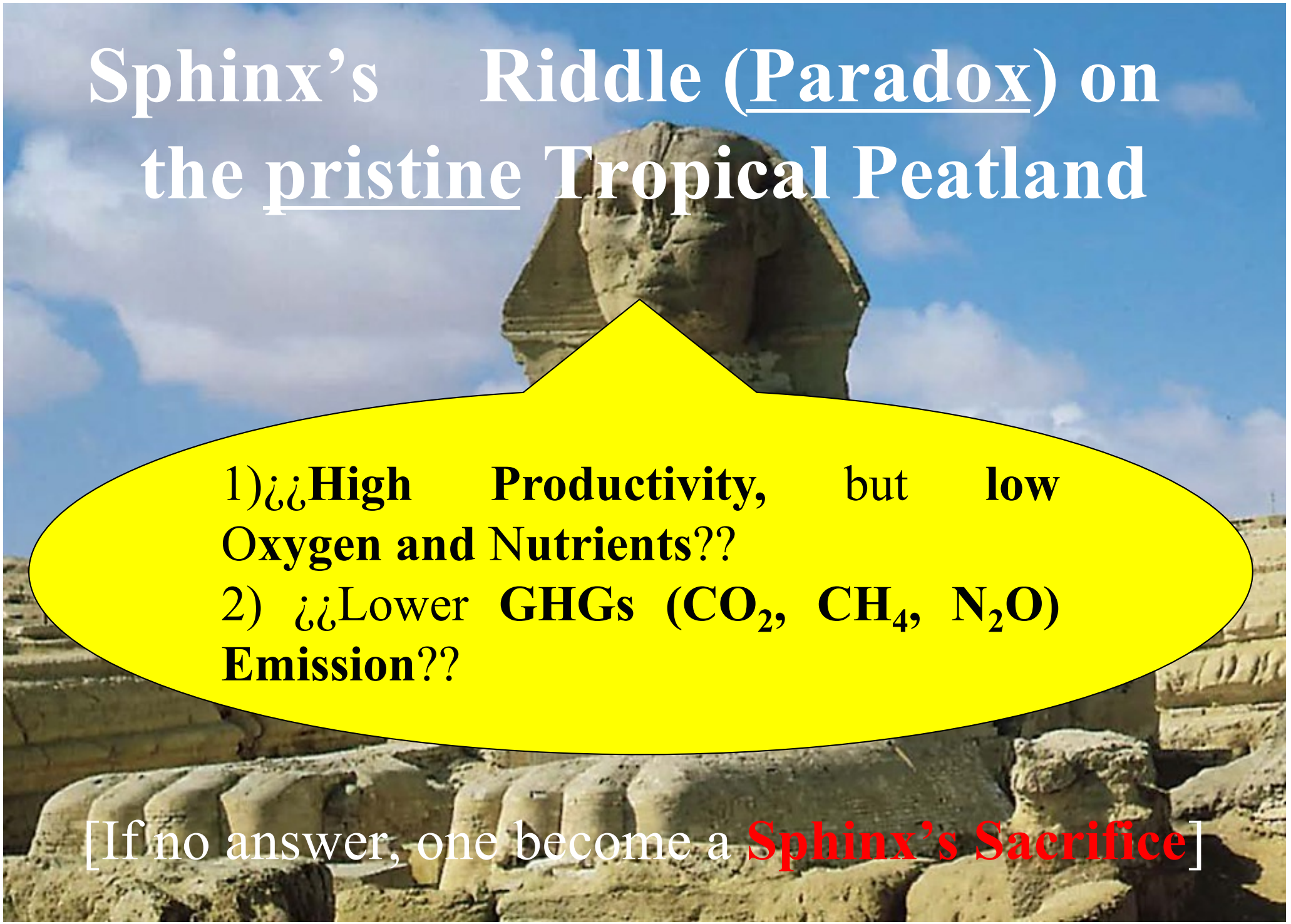

Prof Tsuyoshi Kato


Vice Minister Alue Dohong


Dr Nobuyuki Tsuji


Niken Andika Putri


Dr Hidenori Takahashi


Sphinx's Riddle (Paradox) on the pristine Tropical Peatland
1)¿¿High Productivity, but low Oxygen and Nutrients??
2) ¿¿Lower GHGs (CO_2, CH_4, N_2O) Emission??
[If no answer, one become a Sphinx's Sacrifice]

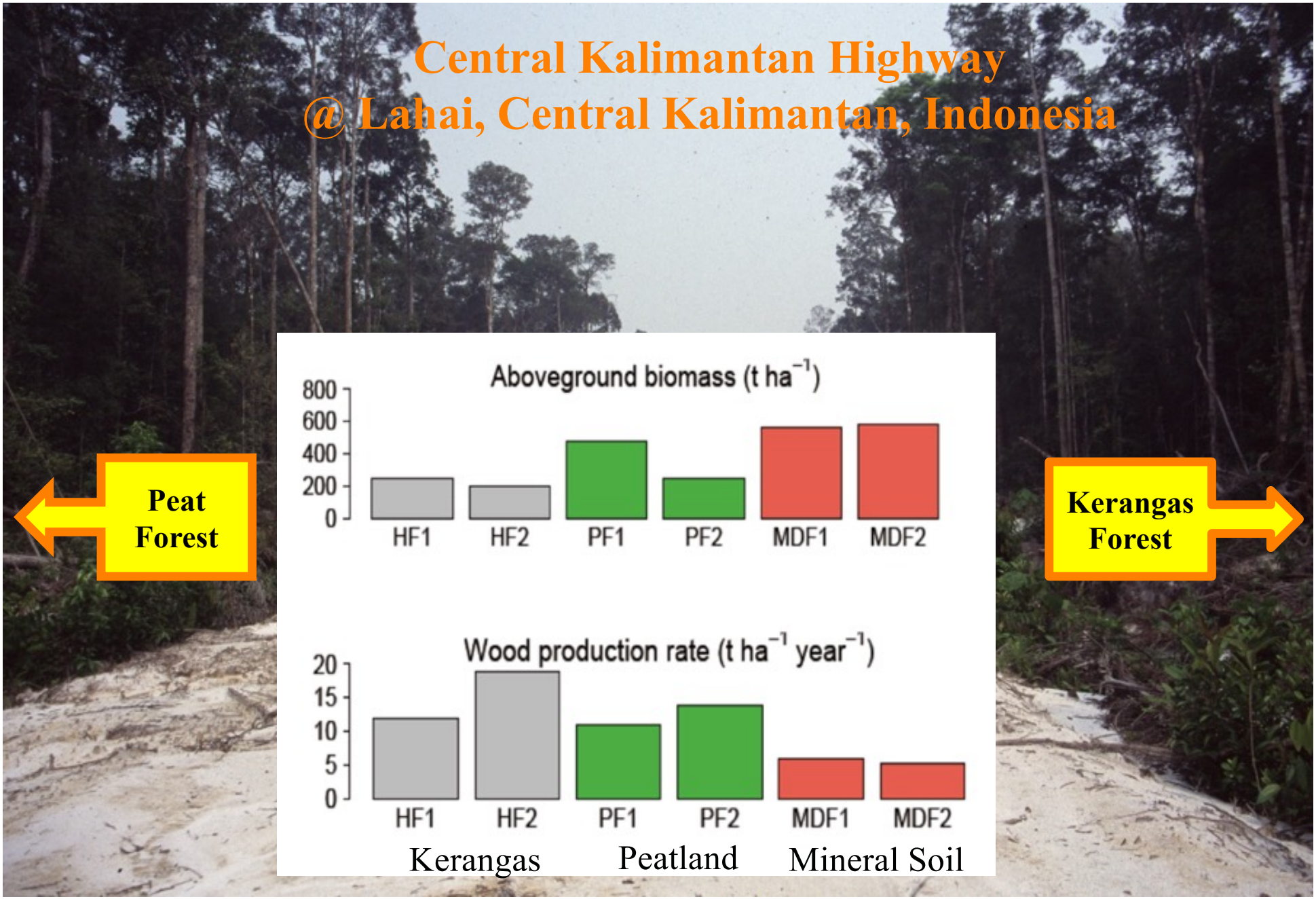
Sphinx's Paradox
(I) High Productivity, but low Oxygen and Nutrients

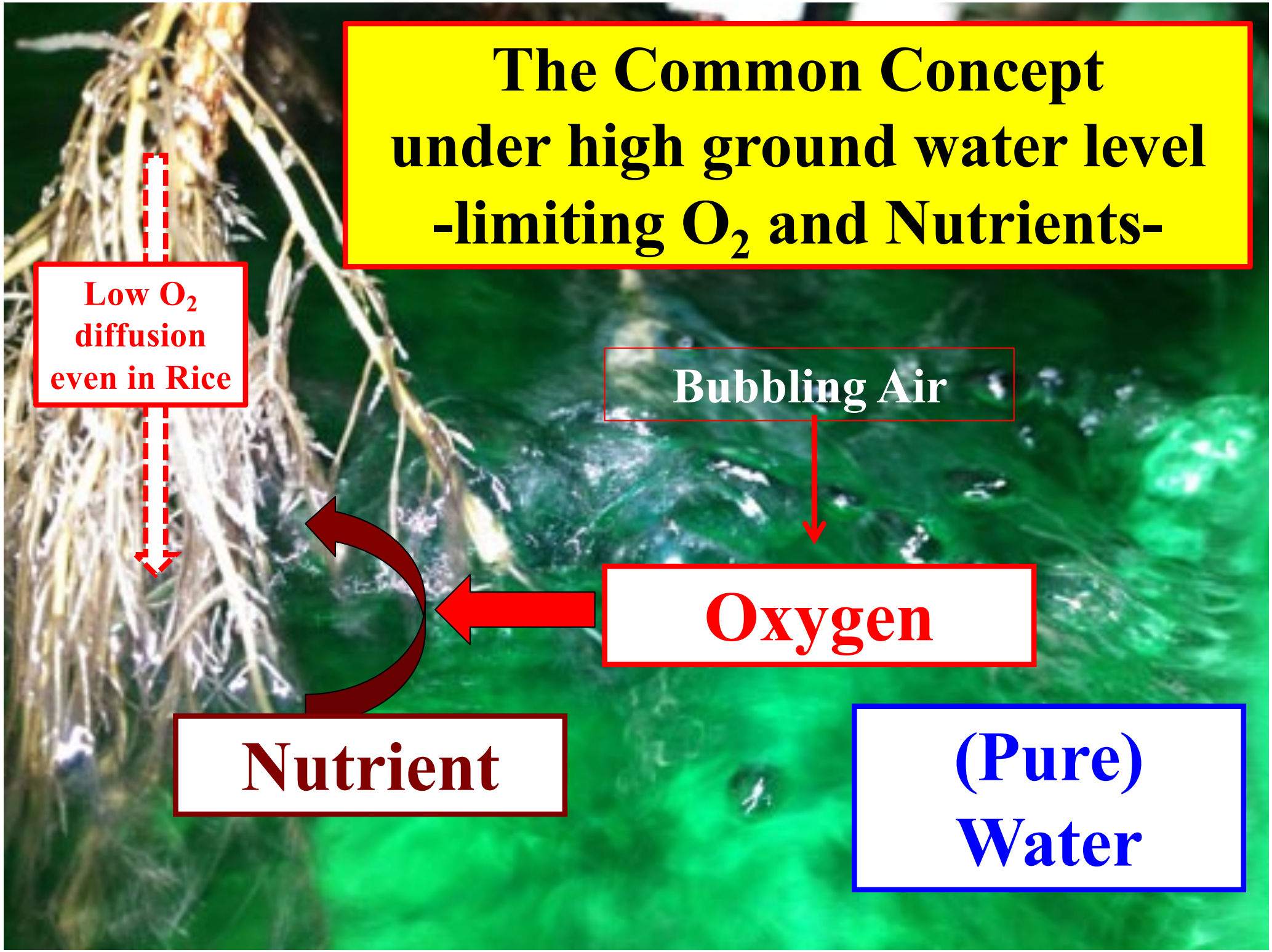
Tropical Peatland

Peatland
(deep peat)

Kerangas
(shallow peat)

Paradox in Tropical Peatland

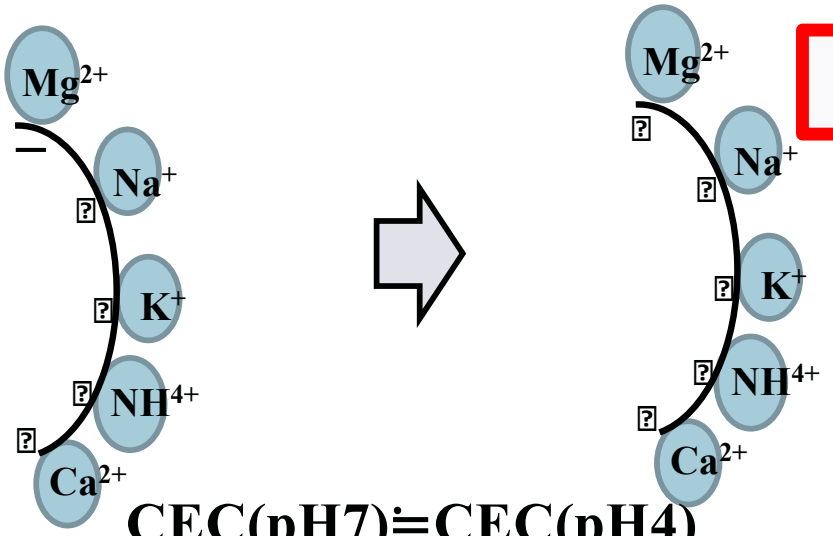



The Common Concept
under high ground water level
-limiting O_2 and Nutrients-
Low O_2 diffusion even in Rice
Bubbling Air
Oxygen
Nutrient
(Pure) Water

Low Cation Adsorption Ability

Soil Clays

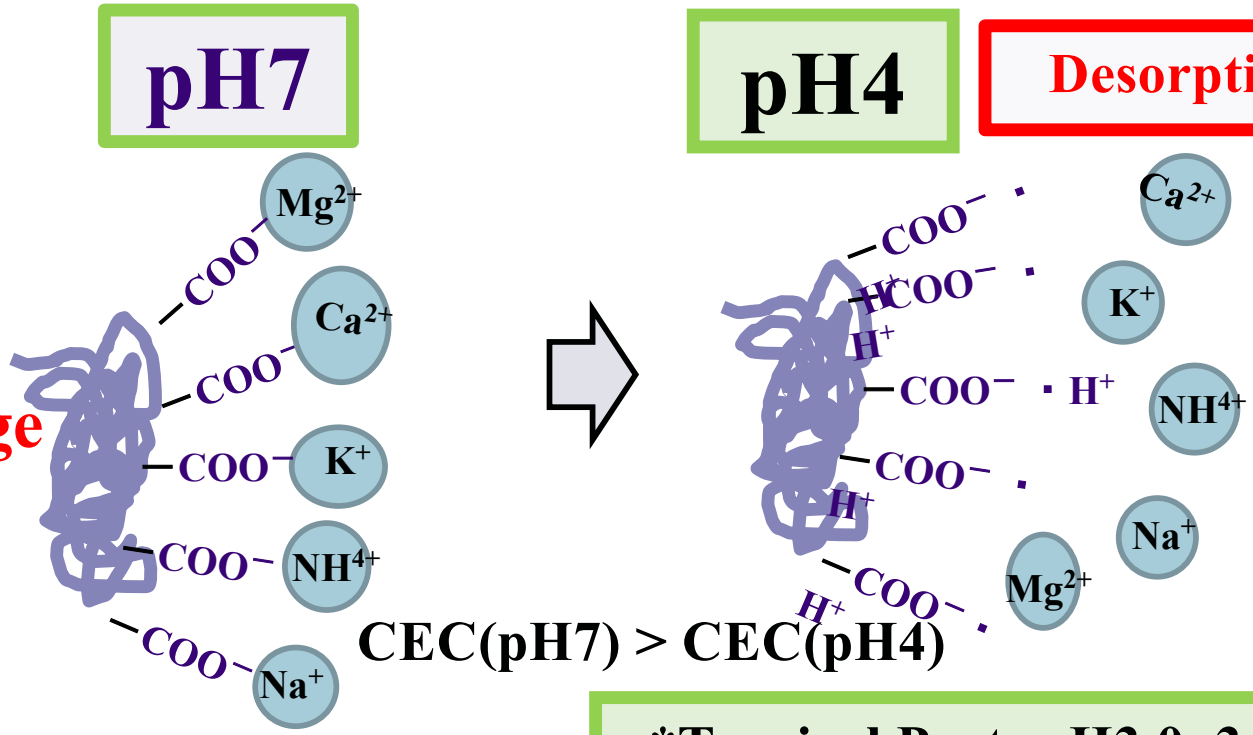
Permanent charge



CEC(pH7)≒CEC(pH4)

Soil Organic Matter (SOM):

pH-depend charge



CEC(pH7) > CEC(pH4)

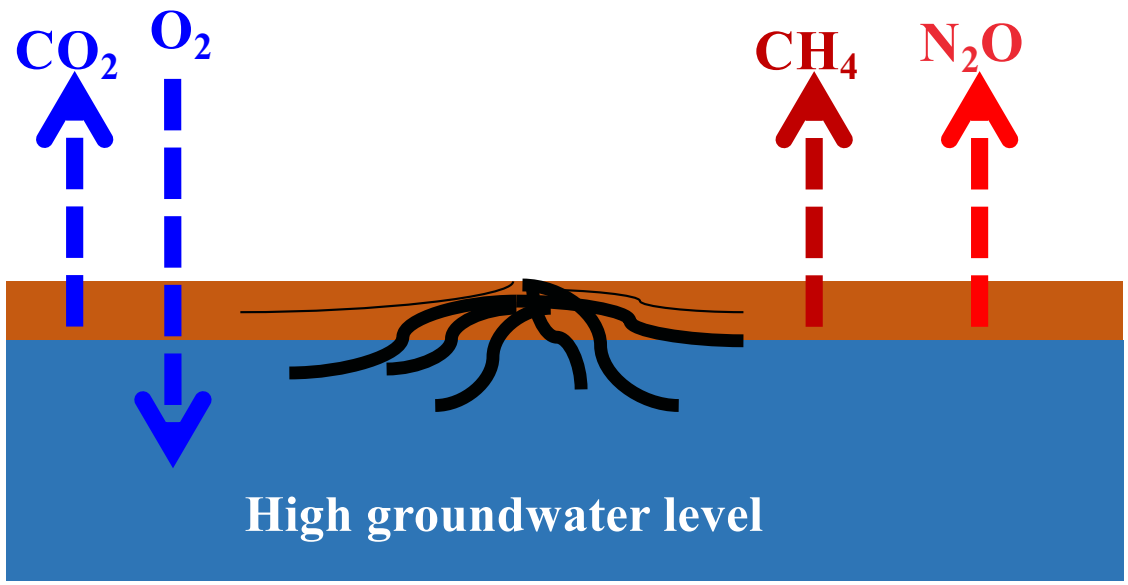
***Tropical Peat: pH3.0~3.5**

Sphinx's Paradox
(II) Low GHGs Emission

Native Peatland

Redox Potential:
+600mV

Redox Potential:
0mV

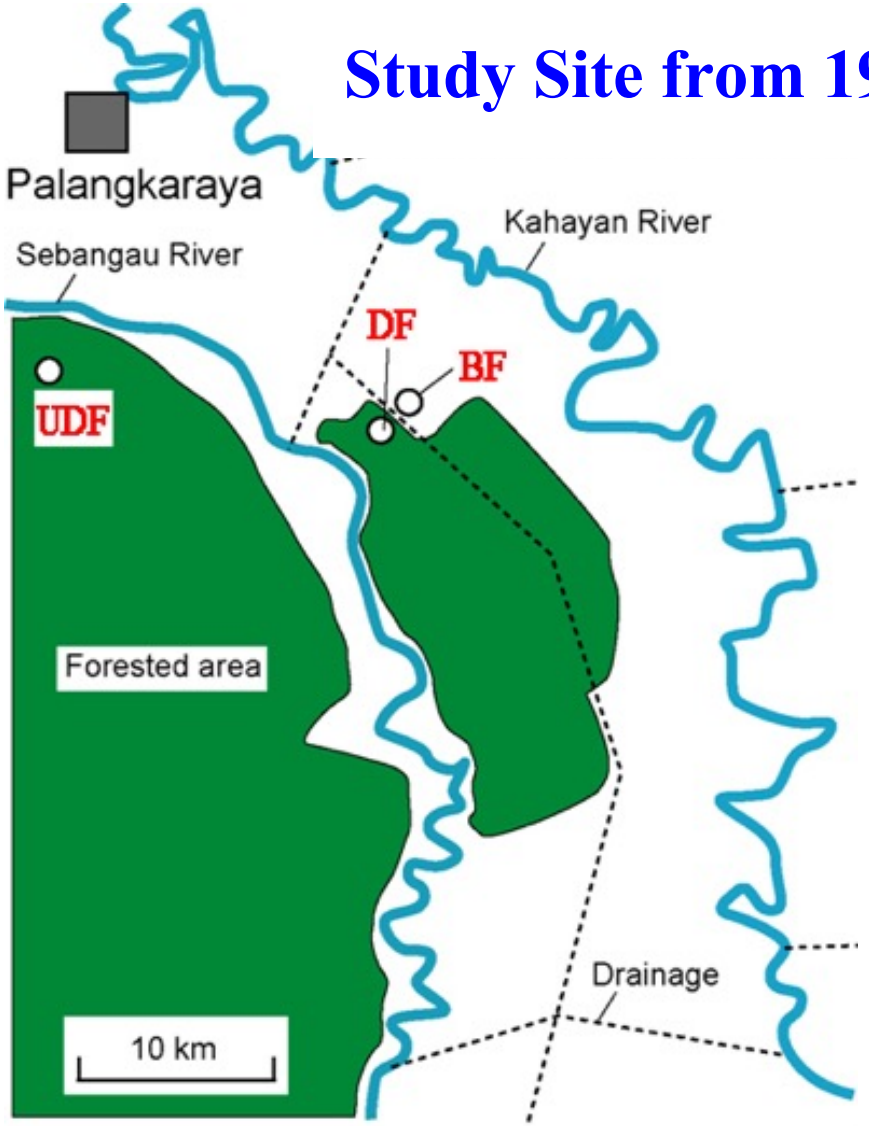


Most Tropical Peatland Projects **fail** to answer Sphinx' Paradoxes

Ex Mega-Rice Project Area in Central Kalimantan, Indonesia

Palangkaraya

Study Site from 1997



Study Topics:

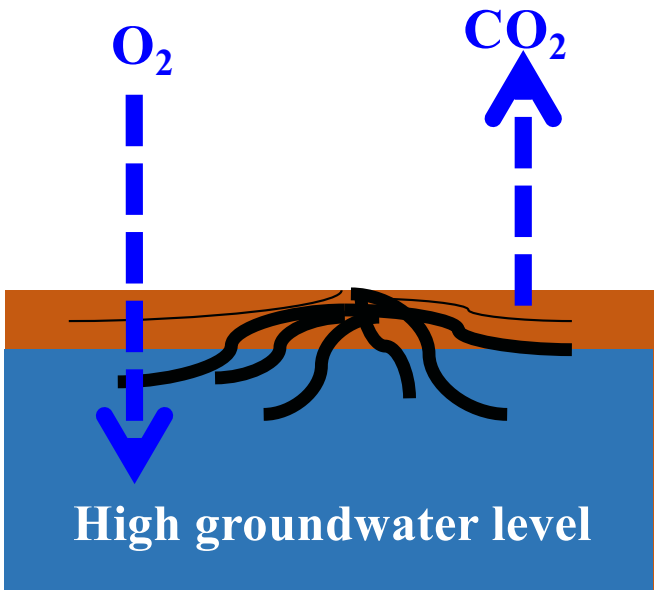
- Green House Gasses Flux (CO_2, CH_4, N_2O)
- Fire Detection and Protection
- Water Table Monitoring and Management
- Peatland Ecology
- Integrated Farming

Ex Mega-Rice Project Area Destroyed

The Worst Sphinx-sacrificed Management
- In the case of Oil Palm Cultivation-

Hydro Culture

Native Peatland

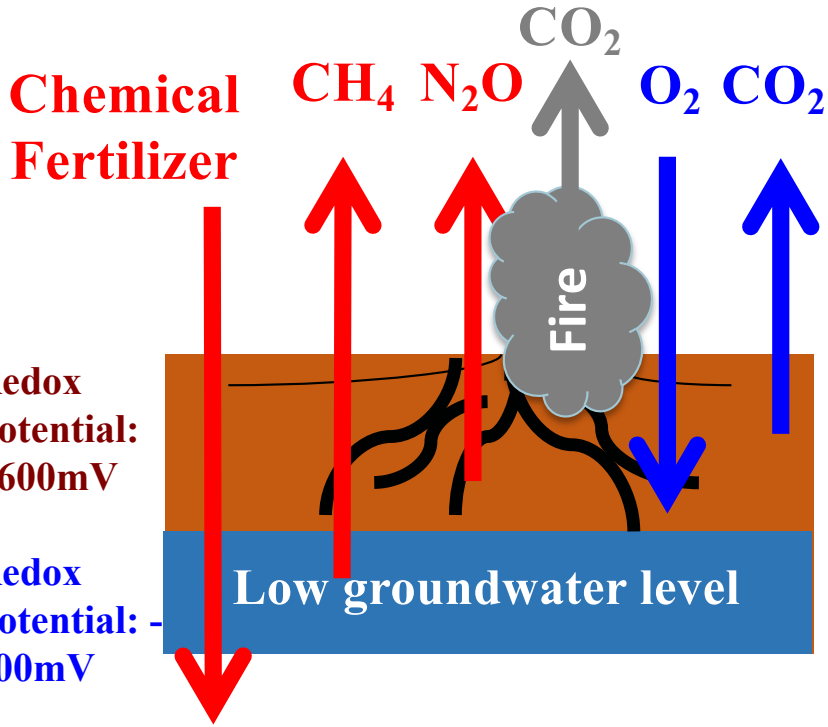


Redox Potential: +600mV

Redox Potential: 0mV

DeHydro Culture

Peatland under Drainage & Chemical Fertilizer Application



Redox Potential: +600mV

Redox Potential: -300mV

Leaching & Pollution

low Productivity & high GHGs Emission!!

Sphinx's Sacrificed Files

(1) Drained Water: CO_2 emission and Fire
(2) Degraded Peatland: Worst Subsoil Appearance
(3) Disturbed Land Surface: Microbe Inactivity
(4) Applied Fertilizer: CH_4 and N_2O emission

Paradox Crime (1) (3) (4)

Oil Palm grown at 50~70 cm water table @PT Meskom Agro Sarimas, RIAU PROVINCE 30 August 2017

1) From 2002
2) Land area: Inti (HGU) seluas 3.705 Ha + Plasma seluas 3.889 Ha.
3) Productivity (FBB: frond base biomass): 17t /ha/year
4) Peat depth: deep 5~8 m
5) Water table: 50-70 cm
6) Tidal effect: small (6.5 km from sea)
7) Fertilizer: FBB ash (7 kg/year/stand) & compound fertilizer (N:P:K=7:6:36)(6 kg/year/stand)
8) Weeds: high compe[illegible]on with weeds

Serious K^+ deficiency even in low water table (50-70 cm) and extremely K^+ high application, indicating that Water Table is not key factor on oil palm production

1985
Acacia trees planting (with chemical fertilizer application after 1-2 m surface layer removal)

Only ferns and grasses growing for a long term

C. rotundatus trees start to grow along with small dich

C. rotundatus trees grow quickly, and plant succession takes off along with small dich

Biodiversity increase all at once **surrounding C. rotundatus tree**

Paradox Crime (1)(3)

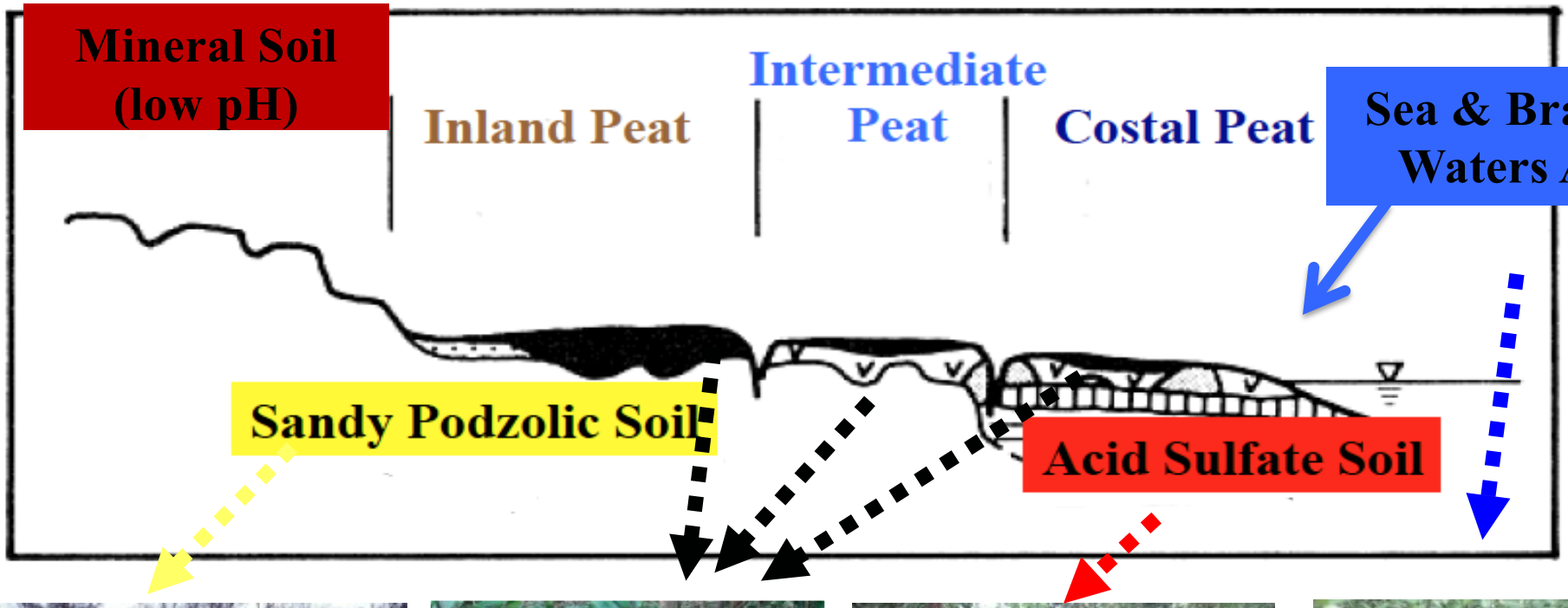
Paradox Crime (1) (3)

Fired at only 2002

Fired at 1997 & 2002

Paradox Crime (2)

The worst four soils in the world



Sandy Podzolic Soil
(砂質ポトゾル土壌)

Tropical Peatland Soil
（泥炭地土壌）

Acid Sulfate Soil
（酸性硫酸塩土壌）

Saline Soil
（塩類土壌）

Paradox Avoidance in Nature

Paradox Avoidance (1)

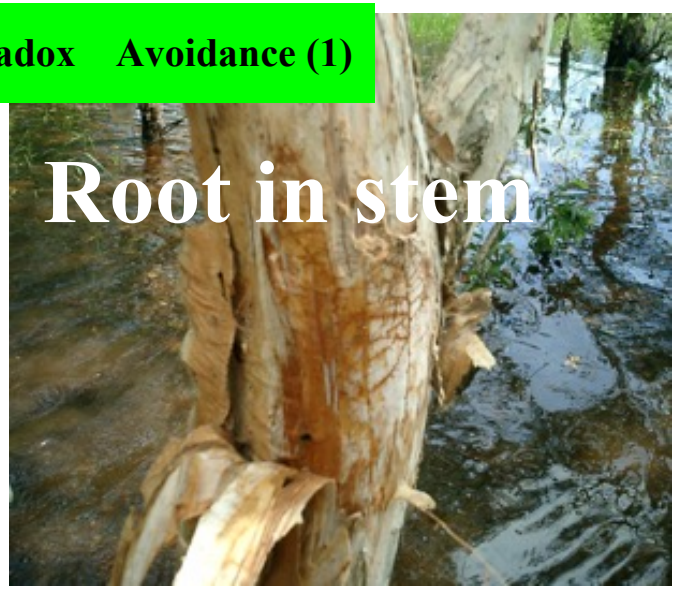
@High GWL

Aerial Roots

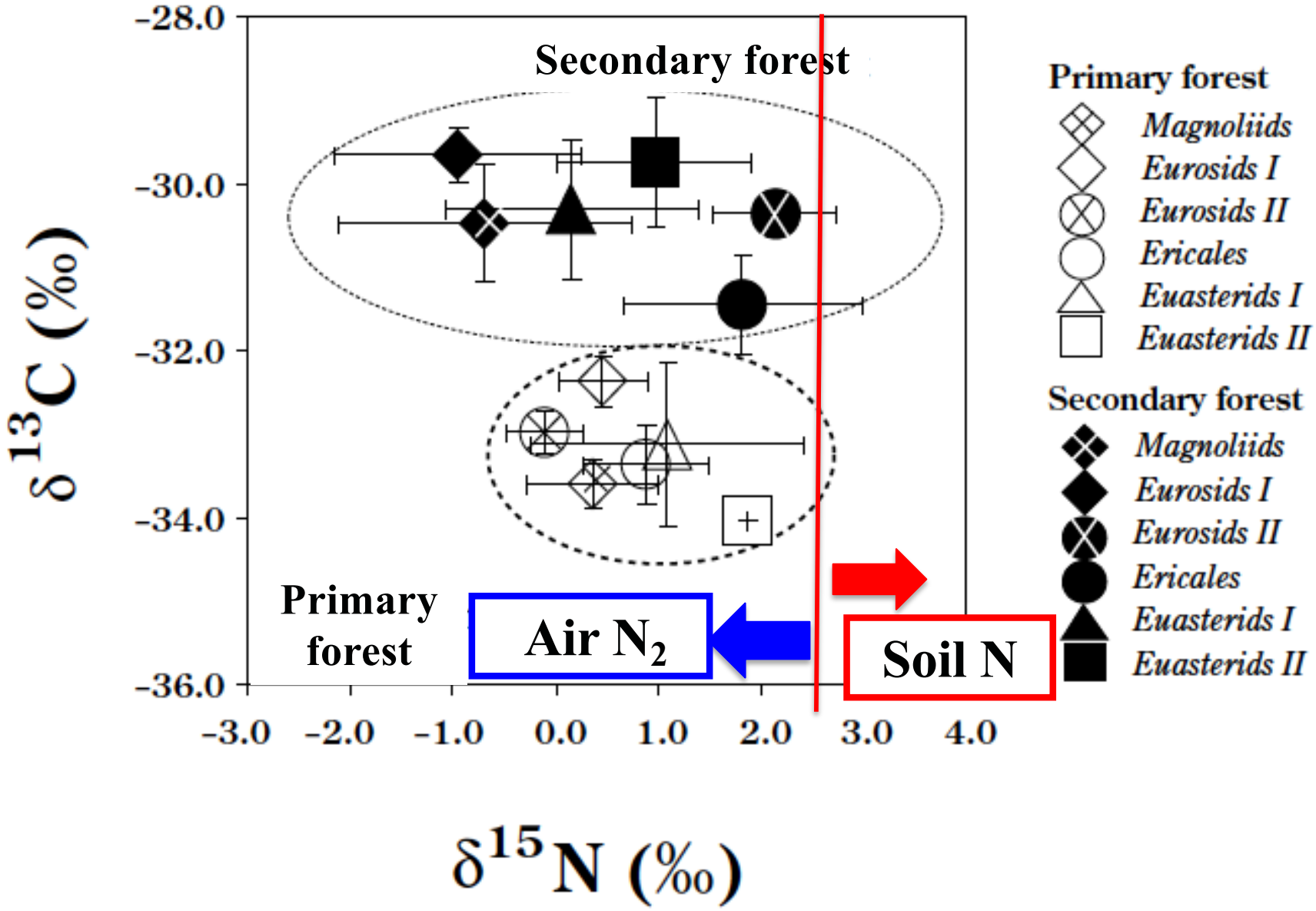
Mound Roots

Paradox Avoidance (1)

Paradox Avoidance (1)



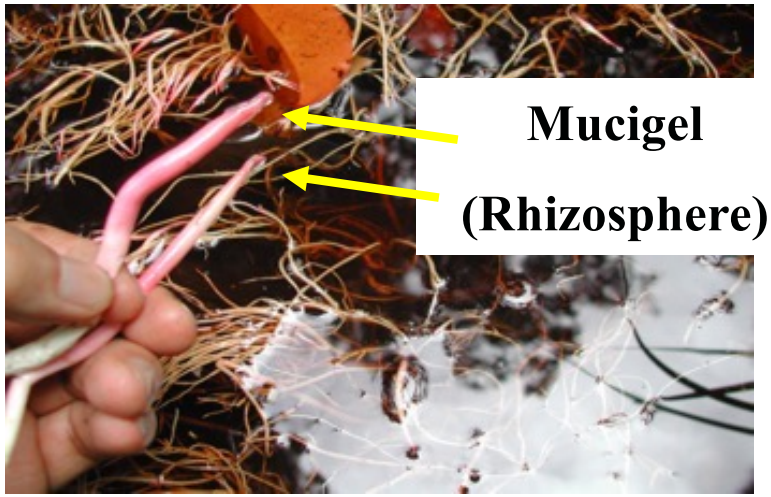
Paradox Avoidance (2)



Yanbuaban, M., Nuyim, T., Matsubara, T., Watanabe, T. and Osaki, M.: Nutritional ecology of plants grown in a tropical peat swamp. *TROPICS*, 16, 31-39 (2007)

Paradox Avoidance (2)

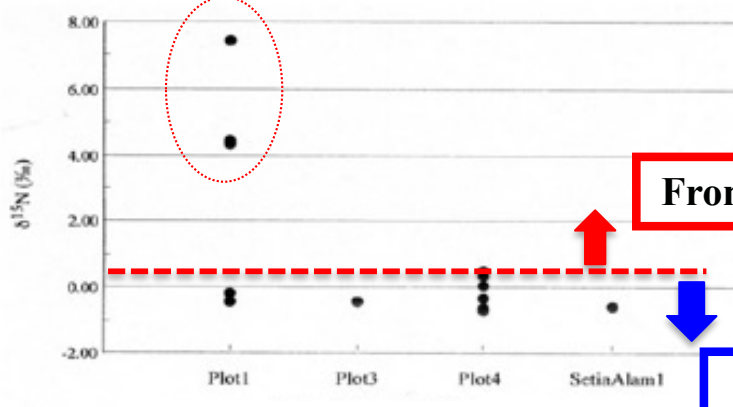
Aerial Root of
Combretocarpus rotundatus
(Tumih or Perepat in local)



Mucigel

(Rhizosphere)

Heavy damaged by fire



From Soil N

From Air N_2

Competition with Tree (Aerial roots) and Grass

Paradox Avoidance (2)

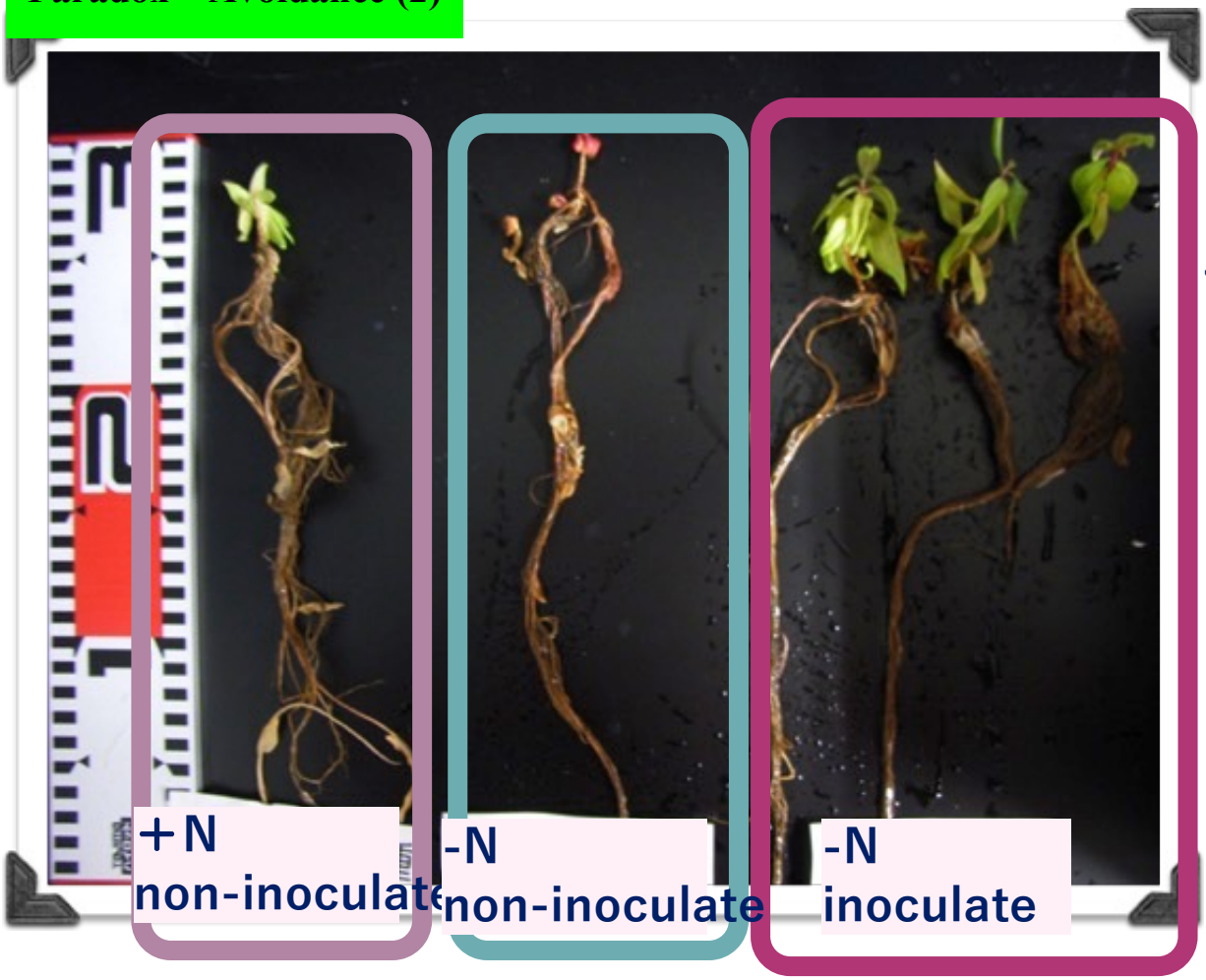
Paradox Avoidance (2)

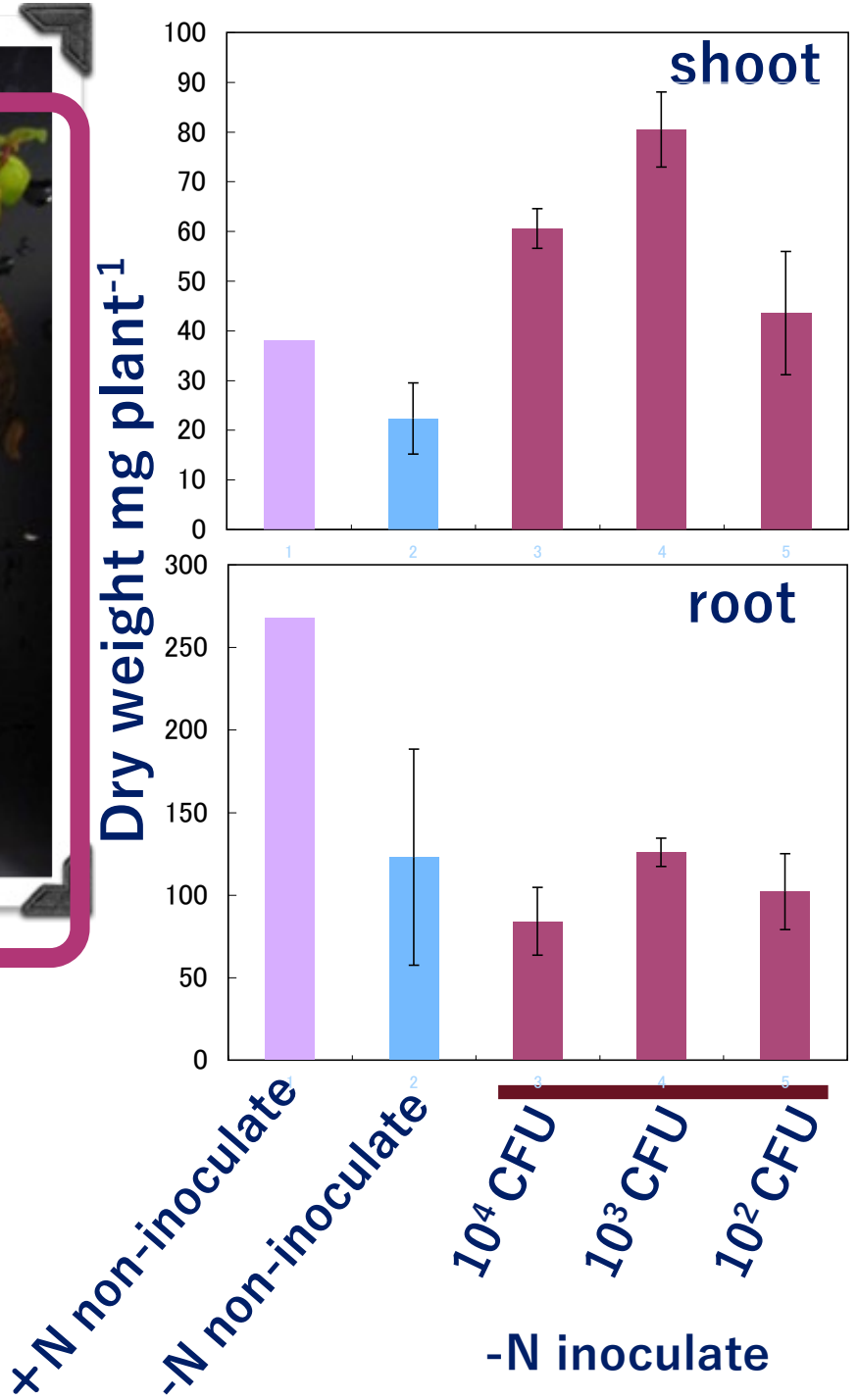
Melastoma malabathricum L.

Mucilage:
Rhizo- and free-living nitrogen-fixing bacteria

No endophytic nitrogen-fixing bacteria

Paradox Avoidance (2)





Plant growth promotion by isolated m-6 inoculation

Paradox Solution
-AeroHydro Culture @High GWL-


Cover Crop
Natural Compost

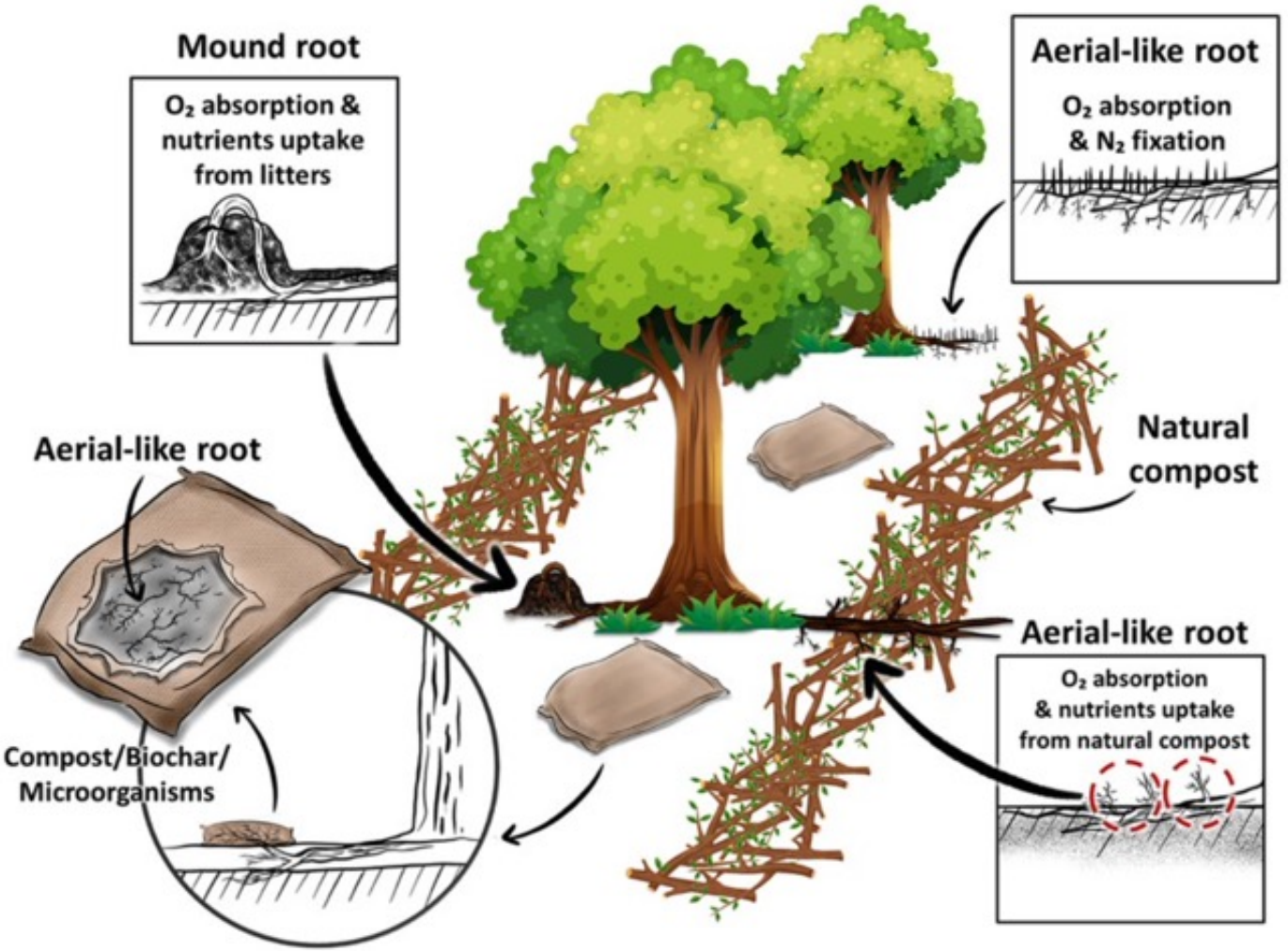
Oil Palm grown at high water table
@Mega Timur Village, Sungai Ambawang District, Kubu Raya Regency, Pontianak

1) 8 years palm for 14 ha by Mr. Suparjo (farmer)
2) High productivity: about 40 ton/ha/year (very high productivity)
3) Sallow peat (1~2 m depth)
4) High water table (10~20 cm from surface)
5) Final stage of peat
6) Tidal effect
7) Soil surface management by organic matters


Natural Decomposed
Compost
Root matt
Root matt

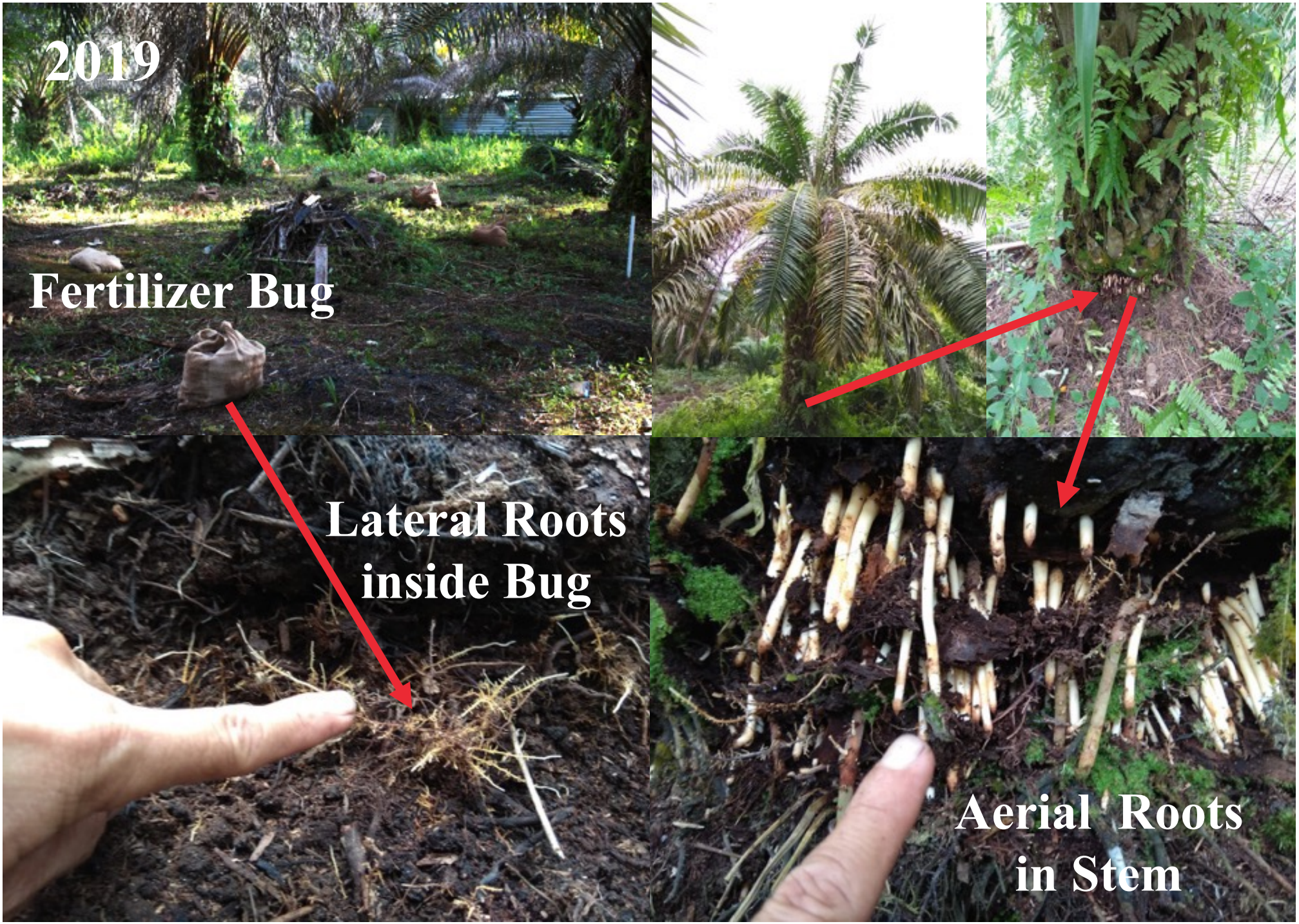
Model on AeroHydro Culture

Compost
Mycorrhiza
Biochar
Zeolite
Chicken manure
PGP substances



AeroHydro culture mimics the native peatland ecosystem under a high groundwater table.

High Ground Water Level (GWL)


2019
Fertilizer Bug
Lateral Roots
inside Bug
Aerial Roots
in Stem

2019

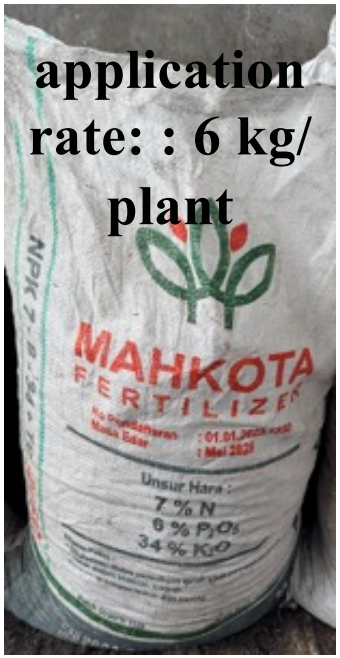
Shorea balangeran

Control	Treatment
2-9 new leaves	13-21 new leaves

2019 Sago palm (Metroxylon sagu Rottb.)

After 4 years

23012025 @ Siak



Treatment

36% higher

even after 5 years

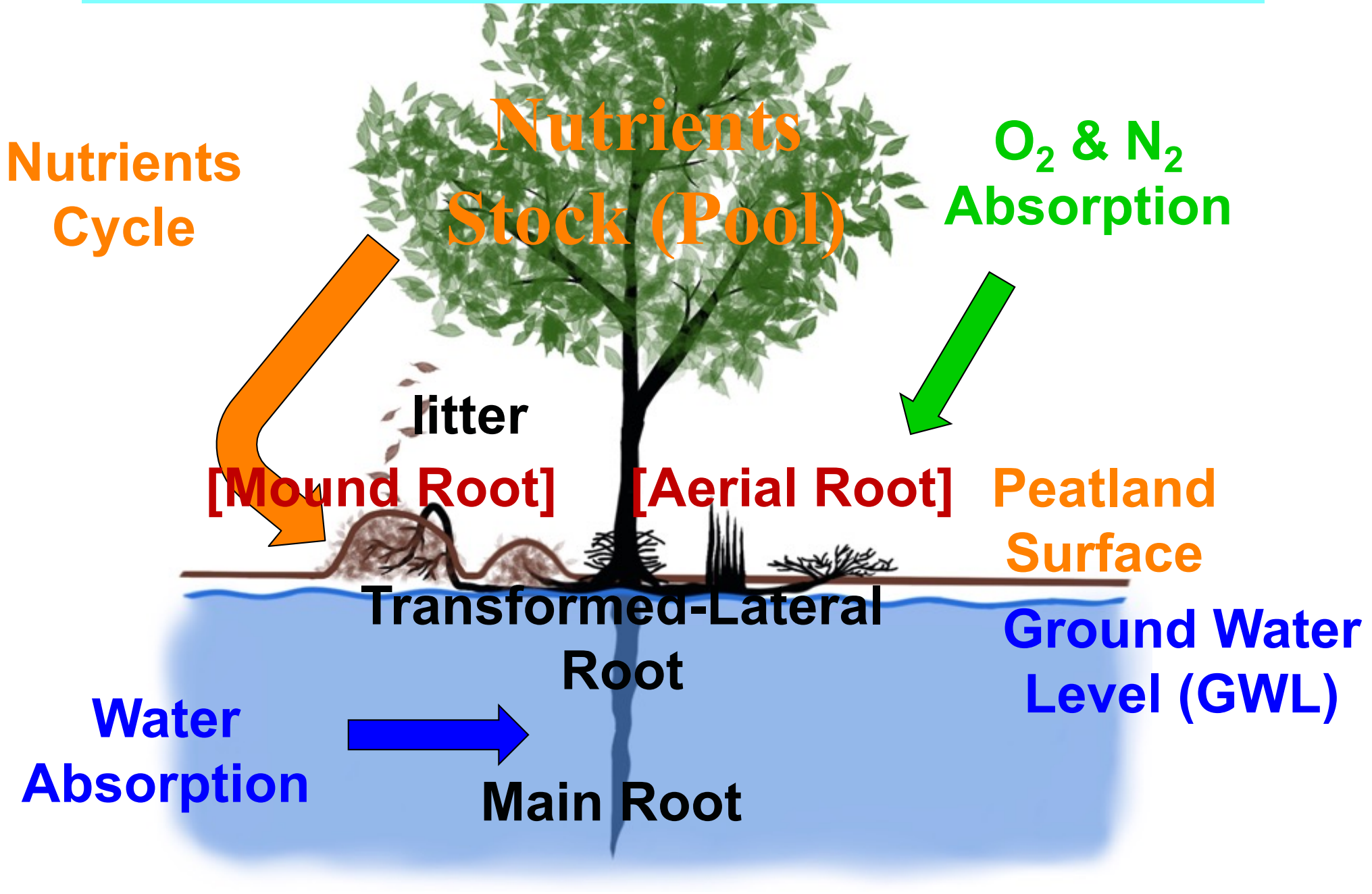
23012025 @ Siak

Treatment –L shape

23012025 @ Siak

Treatment –L shape

Nature based Culture

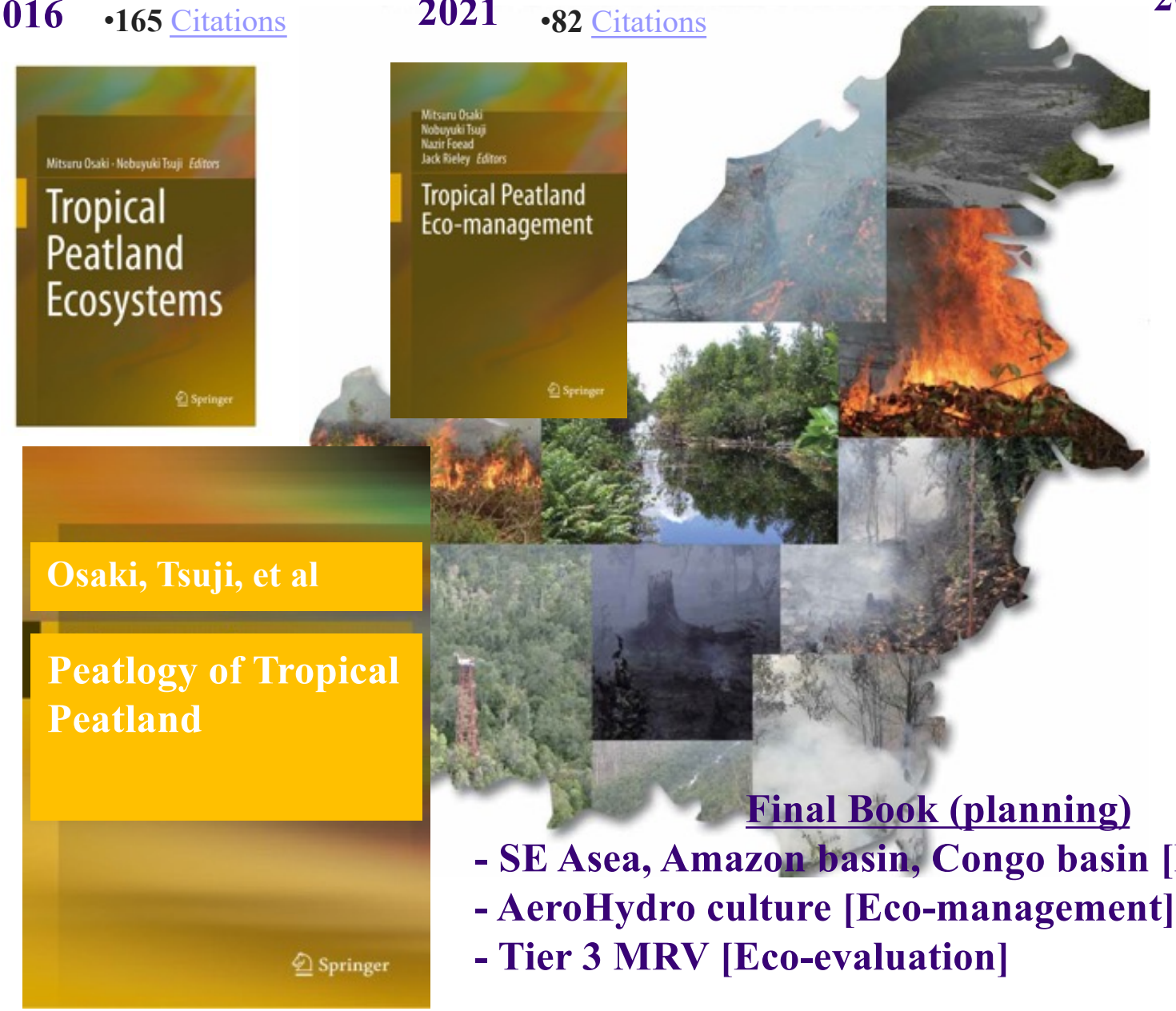


Thank you for your attention!

2016 •**93,000** Accesses •**165** Citations

2021 •**22,000** Accesses •**82** Citations

2024 •**1,452** Accesses



Final Book (planning)

- SE Asea, Amazon basin, Congo basin [Eco-system]

- AeroHydro culture [Eco-management]

- Tier 3 MRV [Eco-evaluation]


JPS
International Lecture - Studium Generale
"Peatlogy" on Tropical Peatland: Paradox & Solution
Pekanbaru, 17 February 2025
KEYNOTE SPEECH
COLLABORATED

Refences

Available at home page of “Japan Peatland Society” (JPS) https://jps.sakura.ne.jp/jspsproc/jspsproc.html

Research history on tropical peatlands in Indonesia by Hokkaido University

1993
1994
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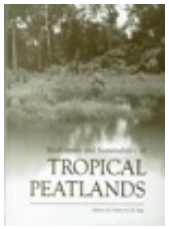
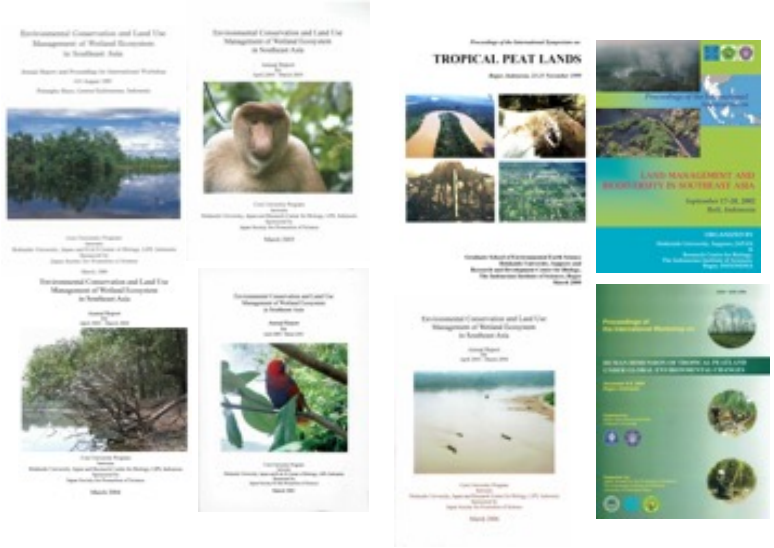
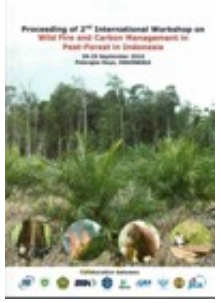
Joint project by
Univs. Nottingham, Leicester,
Palangka Raya & Hokkaido

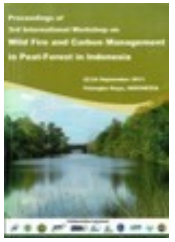


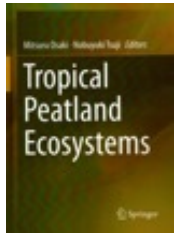
JSPS Core University Program
Japan: Univs, Hokkaido,
Kagoshima, Tottori, Kyoto,
Kanazawa, Tokyo Agr., etc.
Indonesia: LIPI, Biology,
Geo-technology, Limnology,
Bogor Agr. Univ.,
Bandung Inst. Tech.,
Univ. Palangka Raya



JICA-JST SATREPS
Japan: Hokkaido Univ.
Indonesia: BSN, BPPT,
LIPI, FORDA, UPR, LAPAN







IJ-REDD+ Project
Japan: JICA, Hokkaido Univ.
Indonesia: KLHK

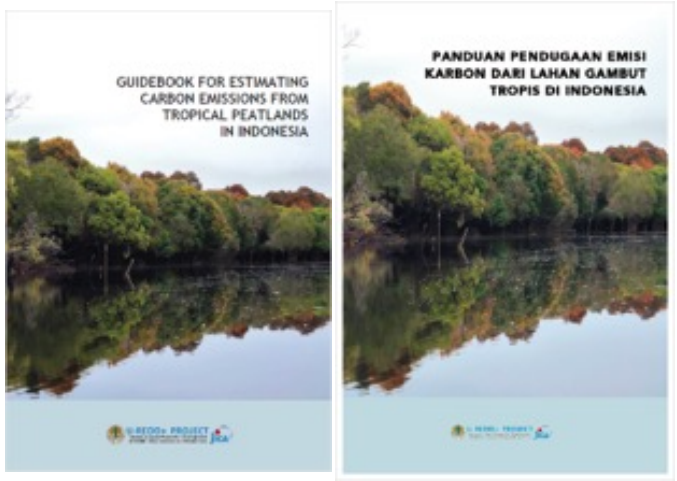
ODA-JICA Program
Japan: Midori Eng. Lab.
Indonesia: BPPT

BRG-JICA-JPS Project
Indonesia: BRG, Japan: JICA, Hokkaido & Kyoto Univs.: JPS

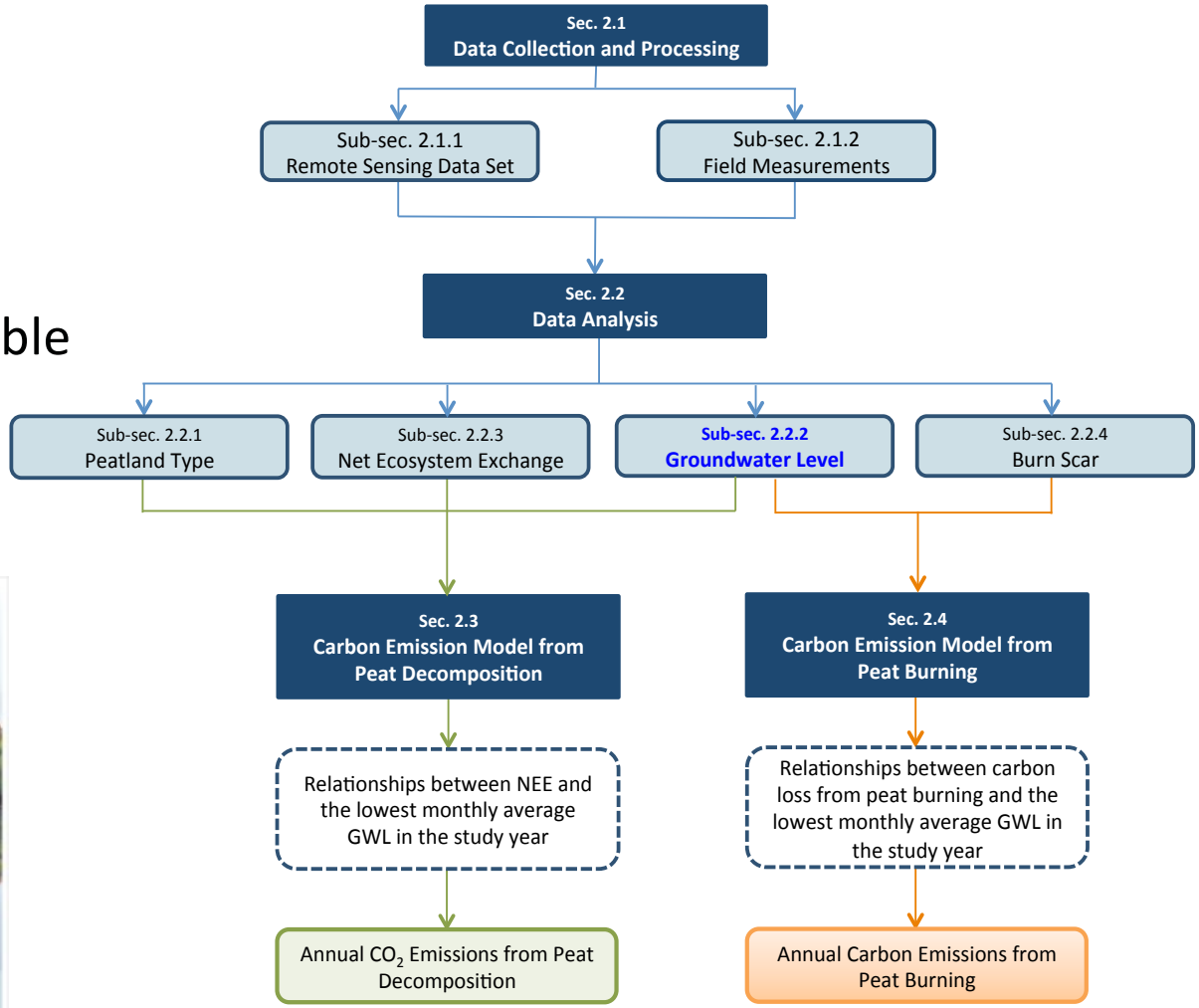
Guidebook for Estimating C Emission

Product of Hokkaido Univ. Task Force in IJ-REDD+ Project (2015-2016)

- How to estimate C emission from:
  1) Peat decomposition, and
  2) Peat burning
  based on GWL estimate.
- General descriptions applicable not only to Central Kalimantan, but also to another tropical peatland.



Guidebook in English & Bahasa



Flowchart of C emission estimation

Website Sites on Osaki's Articles of ”Research Outreach" and ”Research Features"

1. **Osaki M (2022) Natural-capital-based societies in the tropics: Harnessing forest function to combat climate change. Research Outreach, January 21. https://researchoutreach.org/articles/ natural-capital-based-societies-tropics-harnessing-forest-function-combat-climate-change/. https://doi.org/10.32907/RO-128-2187568700**
2. **Osaki M, Kasuga T (2022) Nature as an asset: Natural capital in ‘FutureCity’ _Shimokawa. Research Outreach, April 5. https://researchoutreach.org/articles/nature-asset-natural-capital-futurecity-shimokawa/. https://doi.org/10.32907/RO-129-2508888606**
3. **Osaki M, Takahashi H, Kato T, Tsuji N, Putri NA (2022) Transdisciplinary forest science and the rise of nature-based Solutions, Research Features, September 23. https://researchfeatures. com/transdisciplinary-forest-science-nature-based-solutions-nbs/. https://doi.org/10.26904/RF-143-3252558210**
4. **Osaki M, Tsuji, N, Kato T, Putri NA (2022) Transdisciplinary human-nature science towards triharmony, Research Features, September 23. https://researchfeatures.com/transdisciplinary-human-nature-science-towards-triharmony/. https://doi.org/10.26904/RF-143-3252534021**
5. **Osaki, M, Kawakita N, Kato T, Tsuji N, Sisva S (2022) Transdisciplinary field science based on Land-Surface Management (LSM), Research Outreach, October 17. https://researchoutreach. org/articles/transdisciplinary-field-science-based-land-surface-management-lsm/. https://doi. org/10.32907/RO-132-3403781504**
6. **Osaki M, Kato T, Tsuji N, Putri NA, Sisva S (2022) Fieldlogy Science: A new transdisciplinary science for Earth’s regeneration, Research Outreach, December 5. https://researchoutreach.org/ articles/fieldlogy-science-new-transdisciplinary-science-earths-regeneration/**
7. **Kato T, Asep YA, Silsigia S, Tsuji N, Osaki M (2023) Triharmony/Trilemma of Water Assets in tropical peatland, Research Outreach, February 10. https://researchoutreach.org/articles/triharmony-trilemma-water-assets-tropical-peatland/. https://doi.org/10.32907/RO-134-3957184811**
8. **Osaki M, Kato T, Takahashi H, Sulaiman A, Tsuji N (2023) Triharmony/Trilemma of Carbon Assets in tropical peatland, Research Outreach, February 10. https://researchoutreach.org/ articles/triharmony-trilemma-carbon-assets-tropical-peatland/. https://doi.org/10.32907/RO-134-3991159188**
9. **Osaki M, Kato T, Turjaman M, Asep YA, Tsuji N (2023) Triharmony/Trilemma of Nutrients Assets in tropical peatland, Research Outreach, February 10. https://researchoutreach.org/ articles/triharmony-trilemma-nutrients-assets-tropical-peatland/. https://doi.org/10.32907/RO-134-3989821456**

KEMENTERIAN PENDIDIKAN TINGGI, SAINS
DAN TEKNOLOGI
UNIVERSITAS PALANGKA RAYA
FAKULTAS PERTANIAN
KAMPUS UPR TUNJUNG NYAHO JALAN YOS SUDARSO
KOTAK POS 2/PLKUP PALANGKA RAYA (73111A) KALIMANTAN TENGAH
Website: https://www.faperta.upr.ac.id E-mail: faperta@upr.ac.id; fapertaupr5@gmail.com

Nomor : 0769/UN24.5/TU/2025 14 Februari 2025
Lampiran : 1 (satu) Berkas
Hal : **Undangan International Lecture/Studium Generale: Prof. Mitsuru Osaki, Ph.D. (President of Japan Peatland Society, Japan)**

Kepada yth:
1. Seluruh Wakil Dekan Lingkup FP – UPR;
2. Seluruh Ketua Jurusan Lingkup FP – UPR;
3. Seluruh Koordinator Prodi S-1 dan S-2 Lingkup FP – UPR;
4. Seluruh Dosen Lingkup Prodi Agroteknologi, Kehutanan, Agribisnis, Perikanan, Magister Kehutanan, dan Magister Ilmu Pertanian FP – UPR;
5. Kepala Laboratorium dan Laboran Lingkup FP – UPR;
6. Perwakilan Mahasiswa Prodi Agroteknologi, Kehutanan, Agribisnis, Perikanan, Magister Kehutanan, dan Magister Ilmu Pertanian FP – UPR.

Di –
PALANGKA RAYA

Dengan hormat,
Sehubungan dengan surat undangan dari Rektor Universitas Palangka Raya Nomor: 1499/UN24/TU/2025 Tanggal: 14 Februari 2025 Tentang: Undangan International Lecture/Studium Generale: Prof. Mitsuru Osaki, Ph.D. (President of Japan Peatland Society, Japan), maka sesuai perihal di atas mengundang bapak/ibu/sdr (i) untuk dapat hadir dalam kegiatan dimaksud pada:

Hari/Tanggal : Senin, 17 Februari 2025
Pukul : 09.00 – 11.00 Wib
Tempat : Aula Rahan Gedung Rektorat Lantai 2, Universitas Palangka Raya

Sebagai informasi, dimohon kepada bapak/ibu Ketua Jurusan/Program Studi (Agroteknologi, Kehutanan, Agribisnis, Perikanan) agar dapat menugaskan masing-masing sebanyak 10 orang mahasiswa (i) untuk wajib hadir dalam kegiatan dimaksud dan memakai Almameter UPR.

Demikian surat ini kami sampaikan, atas perhatian dan kerjasamanya kami ucapkan terima kasih.

Dekan,

Dr. Ir. Wilson, M.Si.
NIP. 19651108199302100

Tembusan yth:
1. Rektor Universitas Palangka Raya;
2. Arsip.

KEMENTERIAN PENDIDIKAN TINGGI, SAINS DAN TEKNOLOGI
UNIVERSITAS PALANGKA RAYA
Kampus UPR Tunjung Nyaho, Jalan Yos Sudarso Palangka Raya (73111) Kalimantan Tengah
Telp./Fax : 0536-3221722, 3220445, 3226878, 3222646, 3220446, 3220447
Laman: www.upr.ac.id

Nomor : 1499/UN24/TU/2025 Palangka Raya, 14 Februari 2025
Lampiran : 1 (satu) lembar flyer
Perihal : **Undangan International Lecture/Studium Generale: Prof. Mitsuru Osaki, Ph.D. (President of Japan Peatland Society, Japan)**

Yth.
Bapak/Ibu Undangan (*Daftar Terlampir*)
di -
Tempat

Dengan hormat,

Sebagai provinsi dengan luas hutan tropis dan lahan gambut terluas di Indonesia, Kalimantan Tengah memiliki peran krusial dalam menjaga keseimbangan ekosistem global. Hutan yang lebat tidak hanya menjadi paru-paru dunia, tetapi juga menyimpan karbon dalam jumlah besar. Dengan demikian, Kalimantan Tengah berkontribusi signifikan dalam mitigasi perubahan iklim.

Lahan gambut di provinsi ini juga memiliki peran penting. Gambut mampu menyimpan air dalam jumlah besar dan menjadi habitat bagi berbagai flora dan fauna endemik. Namun, lahan gambut sangat rentan terhadap kerusakan. Oleh karena itu, upaya pelestarian dan restorasi lahan gambut menjadi sangat penting untuk mencegah emisi gas rumah kaca dan melindungi keanekaragaman hayati. Pada sisi inilah peran ilmu pengetahuan dan teknologi terkait gambut dan ekosistemnya diperlukan dalam pelestarian, perlindungan, pemanfaatan dan pengelolaannya.

Kami mengundang Bapak/Ibu/Sdr(i) untuk menghadiri acara **International Lecture/Studium Generale**, oleh **Prof. Mitsuru Osaki, Ph.D (President of Japan Peatland Society/JPS)** dengan judul: "*Peatlogy on Tropical Peatland: Paradox & Solution*", yang akan dilaksanakan pada:

Hari/tanggal : Senin, 17 Februari 2025
Pukul : 09.00 – 11.00 WIB
Tempat : Aula Rahan, Lantai 2 Gedung Rektorat - Universitas Palangka Raya
Kampus UPR Tunjung Nyaho, Palangka Raya – Kalimantan Tengah

Demikian hal ini disampaikan, atas perhatian dan kerjasamanya disampaikan terima kasih.

Rektor,

SALAMPAK
NIP. 196404061988031002

KEMENTERIAN PENDIDIKAN TINGGI, SAINS DAN TEKNOLOGI
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Lampiran 1.

Surat Nomor: 1499/UN24/TU/2025 Tanggal: 14 Februari 2025

International Lecture/Studium Generale :
Prof. Mitsuru Osaki, Ph.D (President of Japan Peatland Society/JPS)

1. Wakil Rektor UPR Bidang Akademik;
2. Wakil Rektor UPR Bidang Umum dan Keuangan;
3. Wakil Rektor UPR Bidang Kemahasiswaan dan Alumni;
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5. Ketua LPPM Universitas Palangka Raya;
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22. Koordinator dan Dosen Prodi Magister Kehutanan FAPERTA Universitas Palangka Raya;
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28. Ketua Jurusan/Prodi Perikanan FAPERTA Universitas Palangka Raya;
29. Dosen Jurusan/Prodi Agroteknologi FAPERTA Universitas Palangka Raya;
30. Dosen Jurusan/Prodi Kehutanan FAPERTA Universitas Palangka Raya;
31. Dosen Jurusan/Prodi Perikanan FAPERTA Universitas Palangka Raya;
32. Dosen Jurusan/Prodi Agribisnis FAPERTA Universitas Palangka Raya;
33. Perwakilan Mahasiswa Prodi Agroteknologi, Kehutanan, Agribisnis dan Perikanan FAPERTA UPR (Masing-masing sebanyak 10 orang);
34. Kepala dan laboran lingkup FAPERTA Universitas Palangka Raya.