



Food and Agriculture
Organization of the
United Nations



Ministry of Environment and Forestry
Republic of Indonesia

WORKSHOP REPORT
Peatland paludiculture -
An opportunity to reduce greenhouse gas emissions and improve livelihoods

9-10 May 2016

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1. Background

Food and Agriculture Organization of the United Nations (FAO) and the Ministry of Environment and Forestry of Indonesia (MOEF) held a two-day workshop “Peatland Paludiculture – An Opportunity to Reduce Greenhouse Gas Emissions and Improve Livelihoods” on 10-11 May 2016 in Balai Kartini, Jakarta, Indonesia. Please see Annex 1 for presentations and Annex 2 for workshop agenda.

The workshop was attended by around 50 participants that covered various Government agencies - including Peatland Restoration Agency (BRG) and Ministry of Agriculture (MOA), local government, experts, development partners, research, civil society and media. Please see Annex 3 for full list of participants.

The objective of the workshop was to explore paludiculture practice options on rewetted peatlands that could reduce greenhouse gas emissions and improve livelihoods at the same time. The participants of the workshop developed a draft paludiculture action plan that could be integrated in the national peatland restoration process.

2. Main content of exchanges

Peatlands provide vital ecosystem services. Drained peatlands cover only ~0.2 percent of the global land surface but cause 10 percent GHG emissions of the agriculture forestry and other land use (AFOLU). Indonesia leads the list of global top emitters, also without the enormous fires.

Along with increasing GHG emissions, peatland drainage also leads to the lowering the height of the land surface, a process known as land subsidence. Land loss - subsidence can be up to 50 cm per year in newly drained areas. Peatland drainage also increases the discharge of carbon as dissolved organic carbon (DOC) and particulate organic carbon (POC) downstream, which reduces water quality in aquatic ecosystems. Over time, peatland drainage causes the vegetation cover to change and biodiversity to be lost. Fires become more frequent. There can be increases in saltwater intrusion, droughts and soil erosion, all of which eventually reduce agricultural productivity. Many tropical peatlands are coastal and will with continuous drainage and >2000 mm of rainfall become undrainable. To avoid negative consequences of peatlands drainage rewetting is required.

However, in order to successfully implement rewetting and rehabilitation programmes, it is necessary to identify responsible peatland management options that can provide additional income sources to local communities. Paludiculture (biomass cultivation in wet conditions) can be considered a responsible management option for peatland management. Paludiculture produces biomass from wet and rewetted peatlands under conditions that maintain the peat body, sustain ecosystem services and may facilitate carbon accumulation. Besides producing traditional agricultural commodities such as food, feed, fibre and fuel, paludiculture can also generate other raw materials for a variety of purposes, including industrial biochemistry. Paludicultures can also deliver substantial co-benefits by preserving and sequestering carbon, supporting climate change mitigation and adaptation activities, regulating water dynamics (flood control) and water quality (purification), and conserving and restoring peatlands' typical

flora and fauna¹². In order to upscale paludiculture practice there is a need to share experiences and assess paludiculture's socio-economic, environmental and gender aspects.

In Indonesia, paludiculture on deforested and burned peatlands not only requires rewetting, but also afforestation. The forest vegetation plays an essential role in the hydrological self-regulation of the domed peatlands – without swamp forest, high water levels cannot be maintained and subsidence will continue. In Indonesia, paludiculture should therefore focus on tree species from peat swamp forests.

Experts presented the following paludiculture species during the workshop: Nipa, Sago, Jelutong (*Dyera polyphylla*), Tengawang nut trees (*Shorea* spp) and Rattan palm trees (*Calamus* spp.).

In Indonesia different types of paludiculture management options are suggested:

- Food production, intercropping and agroforestry in agriculturally used peatland (transmigration areas, Ex-Mega Rice Project area). To identify species for food production it is recommended to look into 165 peat swamp plant species that are (locally) used for food.
- Community forests and agroforestry in buffer zones of protected and rehabilitated peat swamp forests.
- Production of bioenergy plants in deeply flooded areas with no prospect for reforestation. For example, herbaceous plants for bioenergy production (purun) can be cultivated in flooded areas previously burnt.
- Large-scale mixed plantations of commercial peat swamp species as alternatives to drainage-based plantations.

For establishing paludiculture plantations following species are recommended:

- Commercial hardwoods: Ramin, Borneo Kauri Meranti, Belangeran, Kempas
- Non Timber Forest Products: Jelutong, Tengawang/Illipe nuts, Rattan, Gemor, and
- Alternatives to drainage-based pulp-Acacia: *Alstonia*, *Combretocarpus*, *Macaranga*.

Along with cultivation paludiculture, additional livelihoods diversification options were suggested. One option is aquaculture using traditional “beje” farming systems. The existing canals, depressed peatland areas and man-made water reservoirs for fire prevention in degraded peatland areas can be used to develop freshwater aquaculture and vegetation rehabilitation. As aquaculture and paludiculture in peatland areas needs lots of water (very wet peatland), they can protect peatland from fire outbreak, reduce GHG emissions, reduce peatland subsidence, and enhance wetlands biodiversity. If the total canal in peatland area is about 2 million km long, huge amount of fish production can be harvested in a short period of time.

¹ FAO, 2012, Peatlands – guidance for climate change mitigation through conservation, rehabilitation and sustainable use. Available at <http://www.fao.org/3/a-an762e.pdf>

² FAO, 2014, Towards Climate-responsible peatlands management. Available at <http://www.fao.org/3/a-i4029e.pdf>

3. Action Plan

Workshop participants developed a stock-taking and action plan matrix as a result of discussions at the workshop. Please see Annex 4. Note that this draft matrix is not a complete or comprehensive picture of all the work of stakeholders on piloting paludiculture on peatlands in Indonesia, nor is it an approved or agreed plan by Government and donors. It is rather an indicator of activities and work areas that should be covered in order to research the peatland restoration objective in a sustainable manner. Special gaps can be noted in terms of financing the piloting of paludiculture and institutionalization of collaboration mechanisms.

4. Next steps

It was agreed that screening and piloting is necessary for identification of socio-economic site-specific viable options and additional livelihood diversification options are needed e.g. non-peat based economic activities such as aquaculture, chicken/duck/goat/vegetable cultivation.

FAO, together with MOEF, MOA, BRG and other key stakeholders in Indonesia, will develop an integrated paludiculture pilot programme, which will fit into BRG's Roadmap, especially Strategy 3 on implementing sustainable peatland management at landscape level. For more information on BRG's Roadmap, see presentation Day 2, Session 5. The pilot programme will provide clear and quantifiable evidence for the Government of Indonesia to implement diversified and large-scale paludiculture practice in the future.

FAO is also proposing a forum knowledge-exchange, the peatland and climate change mitigation group: <https://dgroups.org/fao/peatlands/> All interested parties are invited to join the group, exchange and share key information, event invitations and other materials on peatlands management.

In addition, FAO will look for opportunities for improving the mapping and monitoring of peatlands as part of the work proposed to be done through UN-REDD in Indonesia and work with MOEF and BRG to improve the tools and information available to land managers and policy-makers.

5. Annexes

(1) Annex 1. URL to workshop presentations

- Day 1: <http://bit.ly/day-1-paludic-presentations>
- Day 2: <http://bit.ly/day-2-paludic-presentations>

(2) Annex 2. Workshop agenda

Day 1 10 May 2016, Tuesday – Room Mawar 1, Balai Kartini Convention Center, Jakarta		
08:30	Registration	
	Session 1: Opening and introduction	<i>Chair: Ageng Herianto, Assistant FAO Representative in Indonesia</i>
09:00	Welcome and introduction to the event	<i>Mark Smulders, FAO Representation in Indonesia</i>
09:10	Keynote Speech: Peatland restoration programme	<i>Nazir Foead, Director, Peatland Restoration Agency - Badan Restorasi Gambut (BRG) - Represented by Budi Wardhana, Deputy of Planning and Cooperation, Peatland Restoration Agency</i>
09:25	Opening and overview of MOEF policy on the hydrological management of peatland soil	<i>M.R. Karliansyah, Director General of Pollution and Environmental Damage Control, MOEF - Represented by Wahyu Indraningsih, Director of Peatland Damage Control, MOEF</i>
09:40	Discussion	
09:55	Group photo	
10:00	Coffee/Tea Break	
10:15	Brief introduction to the objectives of the workshop sessions 2–7 and the outputs Participants introduction and expectations	<i>Chair: Jiwon Rhee, Associate Professional Officer, FAO Representation in Indonesia</i>
	Session 2: Consequences of peatlands drainage and classification of peatlands	<i>Chair: Adam Gerrand, Forest Officer UN-REDD, FAO</i>
10:30	Environmental and socio-economic impacts of peatlands drainage and peatland fires	<i>Dr. Armine Avagyan-Juergenliemk, Climate Change and Natural Resources Management Adviser, FAO</i>
10:45	Peatland Hydrological Units mapping based on One Map Initiative	<i>Wahyu Indraningsih</i>
11:00	GHG reduction from rehabilitation of degraded peatlands: Challenges in winning paludiculture	<i>Dr. Fahmuddin Agus, Indonesian Soil Research Institute, Ministry of Agriculture</i>
11:20	Discussion	
12:00	Lunch break	
	Session 3: Strategies for responsible peatland management	<i>Chair: Dr. Armine Avagyan</i>
13:00	Types of paludicultures and technological and policy needs for upscaling pilots	<i>Professor Hans Joosten, University of Greifswald, Germany</i>
13.15	Peatland rewetting from the perspective of inland fishery and paludiculture developments	<i>Nyoman Suryadiputra, Wetlands International-Indonesia</i>
13.30	Sustainable land use in degenerated peat lands: Nipa and Sago cultivation, possible combinations with rice	<i>J W Taco Bottema, Senior Expert and Economist, Palm Oil Strategic Policy Institute</i>
13.45	Discussion	
14:20	Coffee/Tea Break	
	Session 4: Field examples of rehabilitation efforts	<i>Chair: Professor Hans Joosten, University of Greifswald, Germany</i>

14:45	Water management approaches in peatlands based on comprehensive field data in West Kalimantan	<i>Bong Suhandi and Asep Andi Yusuf, PT. Wana Subur Lestari</i>
15:00	Effective canal blocking technology and practices in Central Kalimantan	<i>Budi Triadi, Balai Rawa</i>
15:15	Cost-effective hydrological restoration from Indonesia	<i>Aljosja Hooijer, Deltares</i>
15:30	Lessons learned from the GIZ BIOCLIME project	<i>Thomas Heindrichs, Head of Programme, ASEAN-German Programme on Response to Climate Change, GIZ</i>
15:45	Discussion	
16:30	Summary of Day 1	<i>Mark Smulders</i>
16:40	End day 1	
Day 2	11 May 2016, Wednesday – Room Anggrek, Balai Kartini Convention Center, Jakarta	
09:00	Results of Day1 and review of Agenda for Day 2	<i>Jiwon Rhee</i>
	Session 5: Monitoring of management impacts	<i>Chair: Arif Budiman, UNDP</i>
09:15	Carbon inventory and water table level monitoring in tropical peatlands	<i>Professor Mitsuru Osaki, Division of Research Innovation and Cooperation Research Faculty of Agriculture, Hokkaido University, Japan</i>
09:30	FAO tools for monitoring of peatlands rehabilitation efforts: Collect Earth Tool and Ex-Ante Carbon Balance Tool (EX-ACT)	<i>Adam Gerrand and Maria Nuutinen</i>
09:45	Roadmap for peatland restoration including paludiculture	<i>Budi Wardhana, Deputy of Planning and Cooperation, Peatland Restoration Agency</i>
10:00	Discussion	
10:30	Coffee/Tea Break	
	Session 6: Group work - GHG reduction potential and interventions	<i>Chair: Dr. Armine Avagyan and Maria Nuutinen, FAO</i>
10:50	NAMAs as a mechanism for funding peatlands rehabilitation	<i>Maria Nuutinen</i>
11.10	Participants will discuss the benefits for different paludiculture interventions using exercises developed by FAO	<i>All</i>
13:00	Lunch break	
	Session 7: Action plan and partnership	<i>Chair: Dr. Armine Avagyan and Maria Nuutinen, FAO</i>
14:00	Input from breakout groups to the action plan	<i>Group rapporteurs</i>
15:00	Conclusions and next steps	<i>Dr. Armine Avagyan</i>
15:15	Final statement	<i>Muhammad Askary, Head of Sub-Directorate Directorate of Peatland Damage Control, MOEF and Ageng Herianto</i>
15:30	Evaluation and feedback	
16:00	End of workshop	

(3) Annex 3. List of participants

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(4) Annex 4. Stock-taking and action plan to support peatland restoration efforts with focus on piloting paludiculture

Annex 4. Stock-taking and Action plan to support peatland restoration efforts		2017	2018	2019	2020
YEAR	2016	2017	2018	2019	2020
Support areas	Actions				
Piloting paludiculture on peatlands	<ul style="list-style-type: none"> > Select and Breed productive species/sorts > Water System Management (as needed) FAO: Start of an inland fisheries project on peatland 	<ul style="list-style-type: none"> > FAO Technical Advice & Support on Agriculture, Paludiculture, Forestry & Monitoring > ICRAF: Collaboration in paludiculture, SPC & practice feasibility > Ministry of Public Works & Housing: Rewetting & Canal Blocking Constructions > Capacity Building: -> Provide training & support -> ensure sustainable supply chain -> technical assistance to farmers & local communities 	<ul style="list-style-type: none"> UNDP: Piloting good agriculture practices of paludiculture FAO: train extension service & smallholders 		
Systematic paludiculture research	Rewetting Project (Piloting)	RESEARCH	University of P. Raya		
	<ul style="list-style-type: none"> > Existing Studies (by: university) > Compile and share key studies > Market research > Prioritize & Selective list -> Decide species 	<ul style="list-style-type: none"> > Social Mapping of peatland area / Central Kalimantan 			
Policies	<ul style="list-style-type: none"> By: MDEF -> to develop a sustainable peatland management strategy (2016-2020) policy -> regulations -> guidelines -> action plan 	<ul style="list-style-type: none"> > Inventory Peatland Ecosystem > Develop regulations/guidelines (by: MDEF) > Ministries: harmonizing conflicting regulations (water table) 	<ul style="list-style-type: none"> > Facilitation & Support for development related policy of paludiculture (by: UNDP) > Dissemination & supervision 	<ul style="list-style-type: none"> CMEARI - Coordinating related ministries/agencies to develop regulations by: Ministry of Economic Affairs DANIIDA: Legislation (policy changes) & Technologies > Rights to access ecosystem services on rewetted land > Rights to grow crops on rewetted peatlands 	
Knowledge	<ul style="list-style-type: none"> FAO: Gather & share recent key knowledge resources on paludiculture GIZ: capacity building on forest and land fire management 	<ul style="list-style-type: none"> > Socialization (improving social acceptability) > UNOPS: Fire prevention through early warning system (FRS) & Local government and community strengthening 	<ul style="list-style-type: none"> DANIIDA: Strategic Environmental Assessment (SEA) & Environmental Impact Assessment (EIA) Delimitate suitable area for paludiculture 		
Build monitoring system	<ul style="list-style-type: none"> Monitoring/ Surveillance FAO: free monitoring tools: Collect Earth RS data tool, EX-ACT GHG emission calc. tool 	<ul style="list-style-type: none"> Guidelines for monitoring systems- ecosystem services; socio-economics; indigenous, GHGs (By: MDEF) 	<ul style="list-style-type: none"> Monitoring and Evaluation Capacity Building 	<ul style="list-style-type: none"> Accompaniment 	<ul style="list-style-type: none"> NASA " GEDI" Global Laser (Lidar) ESA Biomass satellite system on internet. space station from 2020 will provide free biomass data
Tools		<ul style="list-style-type: none"> GHG - Inventory (by: DG of CC- Collaboration with ALL stakeholders) Make guidelines for cultivate paludiculture crops: -> which? -> Why? -> When? Education (training & workshops) 	<ul style="list-style-type: none"> Simplify tools 		
Roles Human	<ul style="list-style-type: none"> FAO: Gather & share recent key knowledge resources on paludiculture GIZ: capacity building on forest and land fire management 	<ul style="list-style-type: none"> WCS (knowledge -> transfer -> collaboration) Ministry of Public Works & Housing Monitoring: paludiculture crops: -> which? -> Why? -> When? Education (training & workshops) UNDP: Linking peatland restoration & conservation with SDGs 			FORBID USE OF DRAINED PEATLANDS
Financing	<ul style="list-style-type: none"> Subsidies Investment Reserve negative subsidies 	<ul style="list-style-type: none"> Investment to start Fishery in the area of rewetted peatland Creating a market for commodities of paludiculture 	<ul style="list-style-type: none"> > Employment > Create Scheme and Market for Payment for Ecosystem Services (PES) > Incentive for "fire-free village" and community-based fire prevention > Peatland Tourism > ECO TOURISM 	<ul style="list-style-type: none"> > Internat. commitment (agreements & donor support, conventions, etc.) > Green Climate Fund funds a Programme! 	
Restoration Ecosystem					
Enhancing Support System (Requirement)	<ul style="list-style-type: none"> Capacity Building Policy Stakeholders > Mapping (Role) > Entitlement > Ownership 	<ul style="list-style-type: none"> Improve: Awareness through promotion Develop supply chains 			
Support areas					
YEAR	2016	2017	2018	2019	2020
		Actions			