RSPO Smallholder Best Management Practices Manual

for Existing Oil Palm Cultivation on Peat

Chapter 4

Integrated Pest and Disease Management

DISCLAIMER

The statements, technical information and recommendations contained in this Manual are based on best practice and experiences, and prepared by the members of the RSPO Peatland Working Group 2 (PLWG 2) and the RSPO Independent Smallholder (ISH)-PLWG subgroup. The guidance in this Manual does not necessarily reflect the views of the RSPO Secretariat or any of the individual contributors, sponsors and supporters of the process. The publication of this Manual does not constitute an endorsement by RSPO, the PLWG, or any participants or supporters of the development of new oil palm plantations in peatland areas. While every effort has been made to ensure the accuracy and completeness of the information in this Manual, no guarantee is given nor responsibility taken for any errors or omissions, in both typographical and content, and over time the contents may be superseded. Therefore, this Manual should be used as a guide and is not intended for the management of farms on peatlands. As the results of the implementation of these practices may vary according to local conditions, neither RSPO nor the PLWG or any contributors or supporters of the process can be held liable for the results of the application of the guidance in this Manual.

This handbook is applicable to smallholders in general (refer to RSPO ISH Standard).

ACKNOWLEDGEMENT

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HOW TO USE THIS BMP MANUAL

This BMP Manual was developed with seven Chapters that focus on topics relevant for existing oil palm cultivation on peat.

Along with this BMP, an extract from the RSPO ISH Standard Auditor Checklist is provided in Annex 1 as a guide for certification bodies and it may also be used by Group Managers (GM).

Non-compliances issued to an Independent Smallholder (ISH) group shall be for the non-compliance to the requirement of the RSPO ISH Standard and not against this BMP Manual.

HOW A GM CAN BENEFIT FROM THIS BMP MANUAL

(Across all chapters)

The objective of this Manual is to provide a set of practical guidance on BMPs for GM and/or smallholders to manage existing oil palm cultivation on tropical peat in line with Criteria 4.4 and 4.5 of the 2019 RSPO ISH Standard.

APPLICABILITY OF THIS BMP DURING AUDIT

This BMP Manual was produced as a recommended guidance for ISH with existing oil palm cultivation on peat. This is not to be taken as a compulsory practice and used against certification since ground conditions may vary according to location. It is the role of the GM or smallholders to evaluate the condition of the farm before the implementation of these BMPs.

CHAPTER 4:

INTEGRATED PEST AND DISEASE MANAGEMENT

04

The core of the Integrated Pest and Disease Management (IPDM) approach is the management to maintain and enhance the numbers of natural enemies to keep pest numbers below economically damaging levels. Within oil palm, IPDM represents a diverse range of approaches, including targeted chemical applications, the management to reduce pest numbers and transmission, and the management to increase the numbers of natural enemies and pathogens of pests.

The key success factor in IPDM is early detection by regular census and speedy treatment. In this respect, all peat estates should have permanent pest census teams. With effective implementation of IPDM, expenditures on pest control on deep peat can be greatly reduced. The amount of chemicals is also reduced to minimise the impact on beneficial and non-target organisms. Chemical treatments are only carried out by using selective pesticides at low rates and in timely manner to ensure minimum impact on biodiversity and the environment.

4.1
IPDM PROCEDURES

01. Biological Control and Cultural Practices

02. Detection of Pest Damages

03. Identification of Pest

04. List of Pest Population

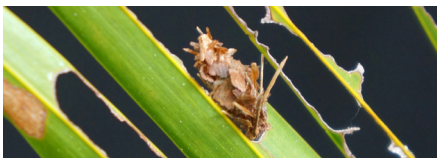
05. Selection of Chemical Control

Remark: *No Prophylactic* ***Chemical Control*** *for Pest and Diseases (of such biological control should come first;* ***only upon uncontrollable outbreak****, chemical use is recommended).*

4.2
PEST AND DISEASE IDENTIFICATION AND BIOLOGICAL TREATMENT

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
Termites *(Coptotermes curvignathus)*  *(Credit: elements.envato.com, twenty20photos)* Monthly census on every palm (100% census) and speedy treatment is recommended. Termite infestation spreads outwards affecting the neighbouring palms in a clustered pattern; hence, identifying the origin of termite colonies is the key to effective control.	Field tests showed that the use of entomopathogenic fungi *Beauveria bassiana and M.* anisopliae are equally potent to control termites infesting standing oil palm.	Fipronil remains the most effective chemical for termite control. The recommended dosage- (5.0% a.i.) at 2.5 ml product per 5 litres of water. Application volumes of the above recommended chemical solution: Palms > 1 year – 5.0 litres/palm Palms < 1 year – 2.5 litres/palm Both the basal region of the spear and crown must be thoroughly sprayed. The hole or the base of the palm is to be sprayed to act as a barrier. When the mud work is thick, slightly scrape it before spraying. The mud work on the infected palms gradually dry up when the termites are killed. Application is to be repeated upon detection of re-infestation.

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
		Alternatively, termite baiting using hexaflumuron baits applied on the mud work of infected palms seems promising. However, this treatment is not cost-effective.
Tirathaba Bunch Moth *(Tirathaba mundella)*  *(Credit: www.flickr.com, 旭宏 林)*	The Tirathaba bunch moth can be effectively controlled using the Integrated Pest Management approach. Tirathaba bunch moths may be regulated by natural predators, especially earwigs (*Chelisoches morio*) and Kerengga ants. Sanitation by removing unharvested/rotten bunches is necessary to remove the breeding sites. It is therefore important to carry out ablation from 12 to 18 months at monthly intervals and remove any rotten bunches to minimise proliferation of the pest.	The spraying of cypermethrin on infested bunches should be strongly discouraged as it will affect the population of the pollinating weevils and natural enemies such as earwigs (*Chelisoches morio*) that predate on the young Tirathaba caterpillars.

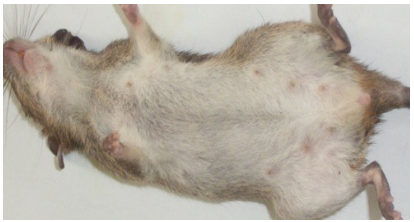
Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
Early detection of Tirathaba bunch moth damage is normally obtained by observing harvested bunches on fresh fruit bunch (FFB) platforms during routine grading. When the infested bunches on the FFB platforms in a block is more than 5%, a systematic census on 10% of palm population in the block (all palms in every 10th row) should be carried out by a team of trained Pest and Disease (P&D) workers.	Good sanitation practices on mature palms are also important as an integral part of Tirathaba bunch moth management. All rotten aborted bunches and badly infested bunches on the palms that attract the bunch moths should be harvested and taken out of the field. Spot spray infected palms and bunches selectively with *Bacillus thuringiensis* (Bt) at 1 g product/litre of water at twice weekly intervals. Use relatively clean water with low suspended dirt. Before spraying, all rotten bunches are to be removed. Ensure pruning is up to date as under-pruning will interfere with the effectiveness of spraying.	
Leaf-Eating Caterpillars The main species of leaf-eating caterpillars are: i. Bagworms (*Mahasena corbetti, Metisa plana and Pteroma pendula*)  *(Credit: www.flickr.com, Scot Nelson)*	Up-to-date biological controls involving natural enemies are not commonly used during pest outbreaks, but there is a real potential for managing pest population using biological control rather than pesticides.	Chemical treatment for the control of leaf-eating caterpillars to be carried out only when census figures are above threshold numbers. Threshold numbers for treatment: 10 per frond for smaller species (e.g. *Metisa plana* and *Darna trima*); 5 per frond for larger species (e.g. *Mahasena corbetti*).

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
ii. Nettle caterpillars (*Darna trima, Setora nitens and Setothosea asigna*)  *(Credit: www.flickr.com, Forest and Kim Starr)*	The establishment of beneficial plants (especially *Cassia cobanensis*) for biological control is effective in attracting predators and parasitoids for biological control of leaf-eating caterpillars, especially bagworms. There have been many attempts to use viruses and entomopathogens to control outbreaks and some success was well reported.	For young palms (1-6 years): 1. Spray 0.005% cypermethrin (knapsack sprayers), fortnightly intervals, on the infested canopy until new infestations clear off. 2. When mist-blowers are used, the concentration is increased to 0.01%. 3. Ensure all the palms in an infested block are treated to minimise re-infestation. For tall palms >8 years: 1. Trunk injection using Acephate (55%) is recommended. 2. The hole is drilled using a power drill at 45° on the lower trunk (about 80 cm from the ground) with a diameter of 1.25 cm and a depth of 15 cm. 3. Plug the hole with a mud ball after introducing the chemical with a syringe. 4. Ensure all the palms in an infested block are treated to minimise re-infestation. 5. Each injection lasts for about four weeks. Post-treatment censuses are needed to ensure that the pest is effectively controlled.

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
iii. Hairy caterpillars (*Dasychira inclusa and Amathusia phidippus*)  Start census when symptoms such as feeding holes on leaves and presence of caterpillars are noticed beyond normal situations. Palms should be censused at an intensity of 1% (one row in 10, one palm in 10) at twice weekly intervals. The frond of each census palm is to be taken from the middle of the crown. Threshold numbers for treatment: 10 per frond for smaller species (e.g. *Metisa plana* and *Darna trima*); 5 per frond for larger species (e.g. *Mahasena corbetti*).		Remarks: 1. It is often necessary to first spray a buffer zone of 5-10 palms on the perimeter of the infested block to minimise spread to neighbouring uninfested blocks. 2. It will also be useful to coordinate with neighbouring estates on treatment if they are also infested by this pest. If trunk injection is employed, the larval growth stages must be identified. Any trunk injection treatment must first identify the larvae and its growth stages at the time of census. Treatment is only effective when the larvae are at the feeding stage.

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
Rhinoceros Beetle *(Oryctes rhinoceros)*  *(Credit: elements.envato.com, chuyu2014)* Monthly census is important for newly planted palms in areas with high rhinoceros beetle populations, especially in areas with more than two successive years of replanting (especially with "no-burn" practice) where large amounts of biomass from replanting provide excellent breeding grounds. The buildup of beetle population can result in serious repeated damage to young palms. A census should record the onset of NEW damages when symptoms such as fan-shaped cut on newly opened fronds, dieback of spear, and bore holes on the frond bases are observed.	Effective control of beetles involves the removal of potential breeding sites by mechanical chipping and pulverisation of trunk chips during replanting. The use of aggregating pheromone integrated with chemical spraying is an effective IPDM tool for monitoring and controlling rhinoceros beetles in immature and young mature oil palm fields.	At low pest levels, carbofuran (3%) or carbosulfan (5%) may be applied to the spear region and the base of new fronds at monthly intervals. Alternatively, pheromone traps can be installed at every 200 m along canals, main drains, collection drains, or roadsides of affected blocks. The height of the trap needs to be about 1 m from the top of the oil palm canopy. When the number of beetles trapped exceeds 10 beetles/trap/ week, twice weekly spraying of 0.06% of cypermethrin to the spears and new frond bases is recommended. It is important to ensure adequate wetting of the spear region, estimated about 150-200 ml solution per palm.

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
Rats i. *Rattus tiomanicus* (Wood rat, white belly)   *(Credit: Sime Darby, En. Meor Badli Shah)*	Barn owls (*Tyto alba*) is commonly used as biological control. Nest boxes are provided at 1 unit per 5 to 10 hectares to encourage the build-up of the owl population.	Start baiting using anticoagulant baits when census results show more than 5% fresh damage. Examples of first-generation anticoagulants are warfarin and chlorophacinone, while second-generation anticoagulants are brodifacoum, bromadiolone, and flocoumafen. In new areas, start with first-generation baits, as they are cheaper and safer for rat predators (e.g. barn owls). Commence baiting block by block with the date properly recorded. For the first campaign, start with 100% baiting (1 bait/palm).

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
ii. *Rattus argentiventer* (Paddy field rat, grayish belly)   *(Credit: Sime Darby, En. Meor Badli Shah)*	Barn owls (*Tyto alba*) is commonly used as biological control. Nest boxes are provided at 1 unit per 5 to 10 hectares to encourage the build-up of the owl population.	Place bait at about 1 m from the palm base or between frond butts if the palm circle is not weeded. Applied baits must be visible to be able to count the acceptance. Application of baits is to be timed after a harvesting round (if possible) to avoid the applied baits from being accidentally removed during loose fruit collection. Replace taken baits at 4-5 day intervals (as it takes about 6-12 days to kill rats after consuming the poison). Stop baiting when acceptance (replacement) declines to below 20%.

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
iii. *Rattus rattus diardi*i (House rat, brown belly)   *(Credit: Sime Darby, En. Meor Badli Shah)*	Barn owls (*Tyto alba*) is commonly used as biological control. Nest boxes are provided at 1 unit per 5 to 10 hectares to encourage the build-up of the owl population.	When bait acceptance is good but fresh damages continue, rat resistance to the first-generation baits is suspected. In this case, switch to the second-generation baits. For the second-generation baits, the replacement interval between two baiting is six to seven days.

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control
Some picture on rat damage  Damaged oil palm fruits because of rats	To carry out regular censuses based on fresh rat damage on palms or harvested bunches. For young palms, censuses should be carried out monthly in high infestation areas when their bases show signs of being chewed by rats. Fresh rat damage census should be carried out daily on the harvesting platforms on the harvested bunches. Depending on the harvesting interval, one can assess the extent of damage daily along with the crop quality control process.	

Pest Identification /Detection	Treatment	
	Biological Control	Chemical Control

Ganoderma

1. Gano, fruiting bodies, basal rot, canopy symptoms

(Credit: Sime Darby, En. Meor Badli Shah)

2. Sanitisation trenches, chipping, etc.

Three to six monthly censuses of Ganoderma infections are recommended. The strategy of more frequent censuses and speedy isolation of early infected palms is to keep Ganoderma infection levels to less than 15% till the end of the 20 to 25 years palm cycle on peat.

Control via sanitisation:

On peat areas, it is important to maintain a water level of 50-75 cm from the peat surface to minimise Ganoderma infections and the spread of this deadly disease on oil palms planted on peat.

Infected palms should be quickly isolated using a 4 m x 4 m x 75 cm deep isolation trench around the infected palm. This is to minimise the spread to neighbouring healthy palms.

It is recommended to use the soil from the trenches for mounding the base of the infected palm as the practice had been reported to prolong the productive life of the Ganoderma infected palms.

During replanting, it will be useful to excavate the infected bole and root tissues as a sanitation measure. The sanitation pit should be at least 2 m x 2 m x 1 m deep.

(Credit: Sime Darby, En. Meor Badli Shah)

ANNEX 1:
RSPO ISH STANDARD AUDITOR CHECKLIST

Criteria		Indicators		Checklist
4.4	Where smallholder plots exist on peat, subsidence and degradation of peat soils is minimised by use of best management practices. **Do any smallholders within the group have existing plots on peat? If no, SKIP**	**4.4 E**	Group manager confirms presence of peat on existing plots within the group and smallholders on peat commit to using best management practices and minimizing subsidence and degradation of peat soils (Reference 1.1 E, Annex 2).	1. Has the group manager identified the existence of peat within the group members existing plots? 2. How many of the group members have peat on their existing plots? 3. Have the smallholders signed a declaration to commit to using best management practices and minimizing subsidence and degradation of peat soils? 4. Is the group manager aware of best management practices for peat?
		4.4 MS A	Smallholders complete training on best management practices (BMPs) for peat. The group has an action plan to minimise risk of fire, to apply BMPs for plantings on peat and manage a water system in the certification unit.	1. Have smallholders participated in training on best management practices (BMPs) for peat? 2. What are the evidence of training conducted? 3. Who provided the training? 4. When was the training provided? 5. Has the group developed an action plan to minimise risk of fire, to apply BMPs for plantings on peat and manage a water system in the certification unit? 6. What are the fire fighting system available? 7. Can the smallholder demonstrate understanding on the best management practices (BMPs) for peat including the action plan to minimise risk of fire and, manage water system?

Criteria		Indicators		Checklist
4.4	Where smallholder plots exist on peat, subsidence and degradation of peat soils is minimised by use of best management practices. **Do any smallholders within the group have existing plots on peat? If no, SKIP** (Continued)	**4.4 MS B**	Smallholders implement the group's action plan based on best management practices, including fire and water management and monitoring of subsidence rate for existing plantings on peat.	1. Have the smallholders implemented the action plan to minimise risk of fire, to apply BMPs for plantings on peat and manage a water system in the certification unit? 2. What are the evidence of implementation of the action plan ? 3. What are the fire prevention and control systems available ? 4. How are the smallholders monitroing subsidence rate for existing plantings on peat ? 5. How are the smallholders monitoring the water levels for existing plantings on peat ?
4.5	Plots on peat are replanted only on areas with low risk of flooding, saline intrusion as demonstrated by a risk assessment. **Do any smallholders within the group have plans for replanting plots that are located on peat? If no, SKIP**	**4.5 E**	Smallholders commit to provide information on all plans for replanting and commit that replanting will only be in areas with low risk of flooding and saline intrusion (Reference 1.1.E, Annex 2).	1. Have the smallholders signed a declaration to commit: • to provide information on all plans for replanting and • that replanting will only be in areas with low risk of flooding and saline intrusion. 2. Has the group manager collected and compiled information on replanting by group members?

Criteria		Indicators	Checklist
4.5	Plots on peat are replanted only on areas with low risk of flooding, saline intrusion as demonstrated by a risk assessment. **Do any smallholders within the group have plans for replanting plots that are located on peat? If no, SKIP** (Continued)	**4.5 MS A** Smallholders with plots on peat complete training on identification of future risks of flooding associated with subsidence and alternate land development strategies.	1. Have smallholders with plots on peat participated in training on identification of future risks of flooding and alternate land development strategies? 2. What are the evidence of training conducted? 3. Who provided the training? 4. When was the training provided? 5. Are the smallholders aware of the risk associated with subsidence? What are the identified risk associated with subsidence? 6. Have alternate land development strategies been identified?
		4.5 MS B Prior to replanting on peat smallholders complete a risk assessment related to flooding associated with subsidence and, where there is high risk, present a plan that includes alternate land development strategies, preferencing alternative livelihood planning.	1. Is there replanting on peat by the smallholders in the group? 2. Has a risk assessement related to flooding associated with subsidence been carried out prior to replanting ? 3. What was the risks identified in the risk assessement ? 4. For high risk area, is there a plan that includes alternate land development strategies, preferencing alternative livelihood planning? 5. Is the group manager aware of replanting activities (on peat) by group members ?

ANNEX 2:
RECOMMENDED SOP FOR FIRE PREVENTION AND CONTROL PLAN

(Adapted version courtesy of Standard Operasional Prosedur Pemadaman Kebakaran Lahan, KUD Makarti No.23/SOP-KUD-MKRSM/IV/2019)

When encountered the risk of fire, there are several steps that can be taken towards fire prevention and control:

1. Should there be fire hotspot detected, the flames should be stopped immediately with basic equipment.
2. The group members shall report to the Internal Control System of the group or Fire Emergency Unit should the basic equipment is not enough to quench the flames.
3. The Fire Emergency Unit will immediately report to the Fire Agency or related agency.
4. All group members are responsible to quench the flames and conduct the evaluation.

ANNEX 3:
RECOMMENDED TABLE/SOP FOR WATER LEVEL MONITORING

(Adapted version courtesy of ISH Group 1 Asosiasi Petani Sawit Swadaya Amanah No.022/ DOK/ SOP/ APSSA/2020 dated 12 February 2020)

1. Maintain the water level by establishing drainage channels and installing modest dams to monitor the water level.
2. Modest dam is established at specific points; specifically, main outlet and the cost will be borne by the smallholder group.
3. The high point of water level on the modest dam will be monitored every one month.
4. In order to monitor the water level, the drainage channel will be set as a water level measurement tool, which is made by PVC pipe. The length of the PVC pipe shall be 2 m (1.5 m above the collecting channel surface and the rest (50 cm) should be rooted in the soil.
5. The measurement on the modest dam will be set as 0 from the soil surface.
6. The measurements in the PVC pipe (0 cm, 10 cm, 30 cm, ...150 cm) should be marked in red with a white base color and the optimum measurements (60 cm and 80 cm) should be marked in black.
7. The material of the modest dam should be waterproofed and used as a cantilever (such as bamboo) and placed in a sand sack.
8. The High Conservation Value (HCV) team identifies the location points to establish the modest dam.
9. The modest dam will be constructed once the request has been approved by the group manager.
10. Once the modest dam has been constructed, the HCV team will evaluate the effectiveness of the dam and monitor the water level every month.
11. Install the subsidence stake from the iron pipe to monitor the decrease of water level.
12. The HCV team identifies the location points from the installed subsidence stack.
13. The result shall be reported to the group manager to get approval for establishing the modest dam.
14. The subsidence stack will be constructed once the request has been approved by the group manager.
15. Once the subsidence stack has been constructed, the HCV team will evaluate the effectiveness of the dam and monitor the water level every month.

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RSPO is an international non-profit organisation formed in 2004 with the objective to promote the growth and use of sustainable oil palm products through credible global standards and engagement of stakeholders.

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