

RSP0 Smallholder Best Management Practices Manual

for Existing Oil Palm
Cultivation on Peat

Chapter 3

Fertiliser and Nutrient
Management for Peat



The background of the page is a close-up photograph of oil palm fruit bunches. The fruits are in various stages of ripeness, showing colors from dark purple to bright orange. The image is slightly out of focus, with the foreground fruits being sharper than the background ones.

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responsibility taken for any errors or omissions, in both typographical and content, and over time the contents may be superseded.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).



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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 3:

FERTILISER AND NUTRIENT MANAGEMENT FOR PEAT

03

The fertiliser requirement in palms planted on peat is not the same as that of mineral soils. Unlike mineral soils, retaining the applied nutrients in peat (depending on the type of peat) is difficult due to low bulk density, high infiltration rate, and high porosity. Under certain situations, the chances of nutrient loss from the applied fertiliser through surface runoff and leaching are high. Retention of nutrients, especially potassium from recycled fronds, may also be difficult in peat due to the high water levels. Therefore, it is important to ensure that appropriate balanced fertilisation and agro-management practices are properly executed to obtain optimum yields in peat.

Table 1 summarises the common deficiencies in oil palm, how to identify them, and what are the possible remedies that can be used to overcome them.

3.1 OPTIMUM FERTILISER APPLICATION GUIDANCE

Adequate fertilisation is essential to successful palm oil production on peat areas. The main premise for the importance of fertilisers is that healthy palms will produce optimum fresh fruit bunch (FFB) yield, which is the primary commodity of most plantations.

3.1.1 FERTILISER MANAGEMENT ON PEAT

Table 1: Fertiliser management by stages

Nursery stage in general	Foliar and compound fertilisers are used with regular spraying of copper sulphate (CuSO ₄) at 0.5-1.0 gm/litre of water and iron (II) sulphate (FeSO ₄) at 3- 5 gm/litre of water.
0 - 10 months	Controlled release fertiliser in planting hole + copper (Cu) and zinc (Zn) fertilisers.
12 - 28 months	Compound fertiliser with boron (B), Cu, and Zn.
More than 28 months	Muriate of Potash (MOP), urea, borate, rock phosphate (RP), Cu, and Zn (mature) (dosage based on foliar analysis, trial results, and visual observations).



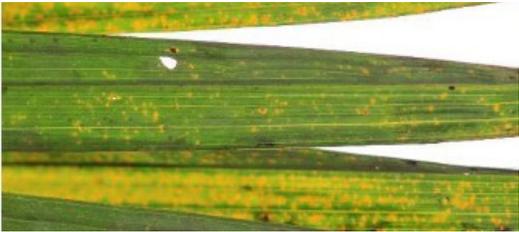
3.1.2 GENERAL FERTILISER REQUIREMENTS FOR MATURE PALM ON PEAT

Table 2: Fertiliser application frequency by type and amount

Fertiliser	Amount (kg/palm/year)	Application (round/year)
Muriate of Potash	4.0- 5.0	3
Urea	0.75 – 1.25	2
Rock Phosphate	1.0	1
Copper sulphate (CuSO ₄)	0.1 – 0.15	1
*Zinc sulphate (ZnSO ₄) (only when necessary)	0.10	1
Borate	0.1 – 0.15	1

3.2 NUTRIENT DEFICIENCY SYMPTOMS

Symptom		Remedies
<p>Nitrogen (N) deficiency and multiple nutrient deficiencies due to water log</p>	<ul style="list-style-type: none">• If palms are under prolonged high water levels, the whole canopy of the palm will turn pale green to yellow (see Figure 1).]  <p><i>Figure 1: Severe nitrogen deficiency under prolonged high water levels.</i> (Credits: IOI Group)</p>	<ul style="list-style-type: none">• With adequate drainage and at the desired water management level, the palms will recover from nitrogen deficiency.• Ensure a maintenance water level of 40 cm to 60 cm at all times for the best water and drainage management. <p>Regular annual application of nitrogen and phosphate fertilisers:</p> <ul style="list-style-type: none">• Peat has high nitrogen, phosphate and magnesium. In a normal situation of peat planting, the urea requirement is generally low.• Annual dressing of 1.25 kg to 1.75 kg of urea applied per palm in two rounds should be adequate.• A single round of rock phosphate at the rate of 1.00 kg to 1.25 kg per palm per year would suffice.

Symptom		Remedies
<p>Potassium (K) deficiency</p>	<ul style="list-style-type: none"> Yellow or orange spots with irregular shapes appear on the leaves, starting in the older leaves. If the leaves are held up to the sun, the light shines through the spots (see Figure 2). Later, the spots turn orange and grow until they fuse together.  <p><i>Figure 2: Potassium deficiency symptoms (Credits: IOI Group)</i></p>	<ul style="list-style-type: none"> Usually, high rates of MOP are recommended in peat areas ranging from 4 to 5 kg per palm with a split application of three times a year.
<p>Boron (B) deficiency</p>	<ul style="list-style-type: none"> Hook leaf on young pinnae of young fronds (see Figure 3).  <p><i>Figure 3: Hook leaf (Credits: IOI Group)</i></p>	<ul style="list-style-type: none"> Borate is normally applied at routine rates ranging from 100 to 150 g per palm. For severe boron deficient palms, it is advisable to apply borate fertiliser at a rate of 200-250 g per palm.

Symptom

Copper (Cu) deficiency

- Unlike mineral soil, copper deficiency is usually common in peat areas only.
- Early symptoms would be young fronds are generally shorter and the leaves become yellow at the tips of the leaflets, but the midribs stay green (see Figure 4).
- In severe cases, the distal end of pinnae will become necrotic.
- Internodes of affected palms also appear shorter and compacted.



Figure 4: Copper deficiency
(Credits: IOI Group)

Remedies

- Application of copper sulphate at a rate of 250 g per palm will improve condition.
- Routine annual application of 100 g of copper sulphate would represent good maintenance.
- Alternatively, it is also possible to carry out foliar spraying of copper sulphate at a concentration of 200 parts per million (ppm) to be sprayed on affected palms on monthly basis till recovery.

Symptom

Iron (Fe) deficiency

- At an early stage, the midribs appear green while the laminae and pinnae turn pale green to yellow (see Figure 5).
- At advanced stage, the young fronds will turn completely yellow with stunted growth.



*Figure 5: Iron deficiency
(Credits: IOI Group)*

Remedies

- Foliar application of ferrous sulphate at a concentration of 1% will be able to control the deficiency symptoms (spray directly at the affected leaf area).

3.2.1 TIMING AND FREQUENCY OF FERTILISATION

- The annual average and probability of rainfall pattern should be studied in order to schedule fertiliser application at the appropriate time. Nutrient runoff by rain is minimal in rock phosphate, therefore application during high rainfall months may not cause severe effect on runoff.
- Urea needs moisture to react, hence application on the moist surface of peat helps to speed up reaction and lower loss of nitrogen through volatilisation.
- Since MOP is a major requirement in large quantities for peat, application in split form with increased frequency and lower dosage will reduce deficiency issue. Best applied during relatively low rainfall months.

3.2.2 PLACEMENT AND METHOD OF FERTILISER APPLICATION

- The effective root zone area in oil palm planted in peat is nearer to the trunk; therefore, the application of macronutrients fertilisers should be as close as possible to the trunk base ranging from 50-100 cm for palms aged 3 years and above (see Figure 6).
- For palms below three years, fertilisers should be applied at about 30-50 cm radius, depending on the growth rate of palms.



Figure 6: Fertiliser application ranging (dotted circle) from 50 cm to 100 cm from the base (Credits: IOI Group)

3.3 ALTERNATIVE FERTILISER

A number of organic by-products and residues are produced in oil palm plantations and mills. These materials can be recycled in the plantation as sources of nutrients, which is also another form of alternative fertiliser. The empty fruit bunches (EFB) (see Figure 7) from mills are a good example of an alternative fertiliser. The benefits are as follows:

- Can be returned to the field for mulching, and incinerated to produce bunch ash.
- Large amounts of organic matter and plant nutrients in EFB make excellent mulch.
- An application of 50 tonnes per ha of EFB provides most of the K required by mature palms.
- Applications of 15 – 30 tonnes per ha of EFB are typical in immature areas, spread in a single layer in a circle around the palm with a 1.5 m wide ring.



Figure 7: Empty fruit bunch (EFB)

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).	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 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
<p>4.4 Where smallholder plots exist on peat, subsidence and degradation of peat soils is minimised by use of best management practices.</p> <p>Do any smallholders within the group have existing plots on peat? If no, SKIP</p> <p>(Continued)</p>	<p>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.</p>	<ol style="list-style-type: none"> 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 monitoring subsidence rate for existing plantings on peat ? 5. How are the smallholders monitoring the water levels for existing plantings on peat ?
<p>4.5 Plots on peat are replanted only on areas with low risk of flooding, saline intrusion as demonstrated by a risk assessment.</p> <p>Do any smallholders within the group have plans for replanting plots that are located on peat? If no, SKIP</p>	<p>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).</p>	<ol style="list-style-type: none"> 1. Have the smallholders signed a declaration to commit: <ul style="list-style-type: none"> • 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
<p>4.5 Plots on peat are replanted only on areas with low risk of flooding, saline intrusion as demonstrated by a risk assessment.</p> <p>Do any smallholders within the group have plans for replanting plots that are located on peat? If no, SKIP</p> <p>(Continued)</p>	<p>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.</p> <hr/> <p>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.</p>	<ol style="list-style-type: none"> 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? <hr/> <ol style="list-style-type: none"> 1. Is there replanting on peat by the smallholders in the group? 2. Has a risk assesement related to flooding associated with subsidence been carried out prior to replanting ? 3. What was the risks identified in the risk assesement ? 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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