

## **RSPO Rules for Oleochemicals and its Derivatives**

*Date Effective : 1st December 2016*

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## 1. Introduction

This paper

- is complimentary to the RSPO Supply Chain Certification Standard (SCCS) to increase transparency for Oleochemicals and its Derivatives.
- replaces the guidance documents for Oleochemicals that were registered under the RSPO Supply Chain Certification Documents named
  - RSPO Rules for Home and Personal Care Derivatives
  - RSPO Rules for Physical Transition of Oleochemicals and its Derivatives
  - Prelude RSPO Guiding Rules for Oleochemicals Basics v 1.0

This paper targets to maximize the transition for Oleochemicals and Derivatives by

- increasing the transparency and explaining the specifics of the key Oleochemicals and its Derivatives
- closing the gap between the RSPO Supply Chain Certification Standard (SCCS) and present business practices in downstream Oleochemical derivatives
- addressing the lack of clarity in Oleochemical derivatives and striving for an overall pragmatic calculation system
- supporting the sequential path towards SG supply chains via MB supply chains by specifically addressing the need for clarity in the MB segments.

This paper does not claim to cover all options in the Oleochemical derivative market. All supply chain participants shall properly and transparently document their supply chain activities to allow for auditor scrutiny. Members and stakeholders are invited to share their experiences with this updated guideline to support the improvement of this process through the RSPO Standing Committee Trade & Traceability Working Group Oleoderivatives.

This paper is valid from December 1, 2016 onwards with a grace period of 6 month. This paper will be revised alongside with the revision of the RSPO Supply Chain Certification Standard (SCCS) in 2018.

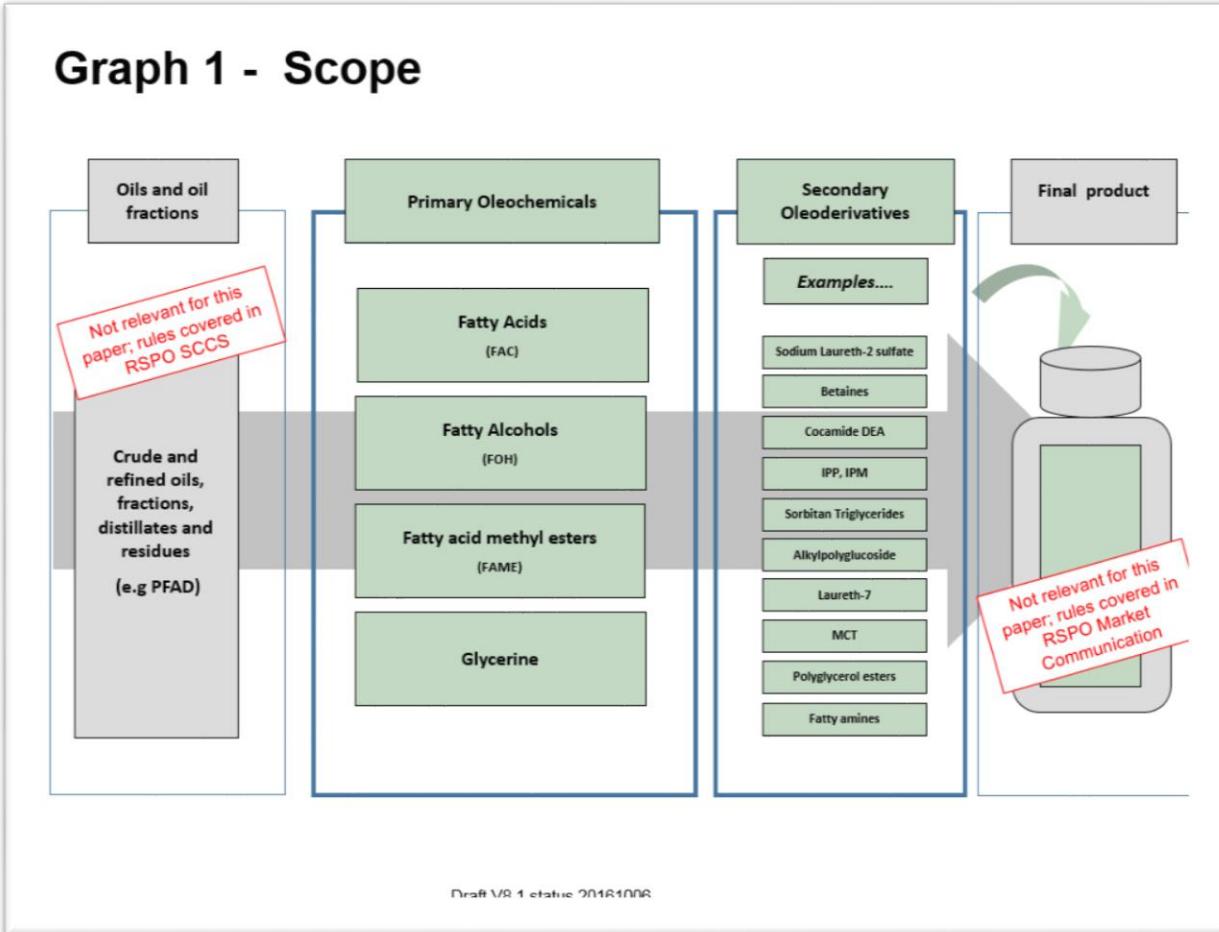
## 2. Definitions

Distillation factor	Purification of mixed fatty acids by distillation to produce purified fatty acids.
Fatty acid and fatty alcohol composition factor	The proportion of the fatty acid / fatty alcohol chain length in the product vs. raw material.
MB claim transfer	Transfer of volume-based MB claim in a booking system.
MPOB C-chain guideline	Malaysian Palm Oil Board; defines the oil source based on C-chain distribution.
Oil palm products	Products produced by the oil palm, including its fruits and kernels.
Oil yield factor	As defined by RSPO T&T Supply Chain Standard (see link <a href="http://www.rspo.org/">http://www.rspo.org/</a> ).
Palm and palm kernel oil fractions	Olein, stearine.
Primary oleochemicals	Products obtained from processes changing the triglyceride structure.
Product conversion factor	Molecular weight – based factor determining the portion of palm-based C-chain in a product vs. non-palm portion in secondary oleoderivatives.
Product loss factor	Product losses occurring in distillation, transesterification and splitting processes.
Product yield	Yield schemes for oils and fractions as fixed in the SCCS C7.1 and 7.2. and/or yield schemes for Primary Oleochemicals as fixed in table 3a and 3b.
Secondary oleoderivatives	Products obtained after multiple chemical conversion steps with Primary Oleochemicals as precursor.
Splitting factor	Splitting (or hydrolysis) of the triglyceride molecules of fats and oils in the presence of water to yield glycerine and a mixture of fatty acids.
Transesterification factor	Transesterification of vegetable oils and fats to fatty acid methyl esters.

## 3. Scope

### 3.1 Raw materials in scope

The scope of this paper is limited to the **major Primary Oleochemicals and Secondary Oleoderivatives** (see definition in chapter 2, illustrated in graph 1 and listed in table 1). The principle however may serve as guidance for other downstream secondary derivatives. Whether palm oil, palm kernel oil or its fractions are the basic oil feedstock shall be determined based on the MPOB carbon chain length guideline (see table 2). In case of interchangeability of feedstocks to produce the same derivative, the choice of feedstock in the actual process route shall be made transparent to the certification bodies. In the case of MB products made from mixed palm oil and palm kernel oil, the oil coverage may be based on the major oil component of the product.



### 3.2 RSPO Supply Chain module in scope

This paper covers the RSPO Supply Chain module Identity Preserved (IP), Segregation (SG), Mass Balance (MB) and Book & Claim schemes.

## 4. General Guideline for Calculation

The calculation factors focus on derivatives containing a majority of C6 - C18 C-chains. Not in scope of this paper are

- products with dominant >C18 C-chains. They will not be derived from palm oil or palm kernel oil.
- crude and refined (RBD) oils, their fractions, distillates and refining residues (e.g. PFAD). They follow the yield scheme of the RSPO Supply Chain Certification Standard (SCCS), see link: <http://www.rspo.org/>

## 4.1 Segregated (SG) / Identity Preserved (IP) Scheme

SG/IP products are obtained through proper segregation requirements throughout the manufacturing and handling process. In line with the RSPO Supply Chain Certification Standard (SCCS, see link: <http://www.rspo.org/>) for SG and IP certification.

The calculation for Primary Oleochemicals in scope (see graph 1) shall use distinct factors which are based on the actual oil requirement (yield factors); the yield factors in this document (table 3) are for guidance only and manufacturers must document supply chain activities for auditor's scrutiny. Manufacturers shall apply the yield-based factors for Primary Oleochemicals (see table 3).

Manufacturers of Secondary Oleoderivatives (see graph 1) shall apply the standard conversion factors for Secondary Oleoderivatives as given in table 4 as guideline (non - mandatory) with possibility of using actual yields.

In the case where a Secondary Oleoderivative product conversion factor is not (yet) covered in the existing document already, the guidelines for calculation under 4.4. (see graph 9) shall apply.

## 4.2 Mass Balance (MB) Scheme

This guidance shall clarify some key specific elements for the application of the MB Scheme in Primary Oleochemicals and Secondary Oleoderivatives. These elements shall close the gap between the **RSPO Supply Chain Certification Standard (SCCS)** and current practices until the next review of the SCCS in 2018.

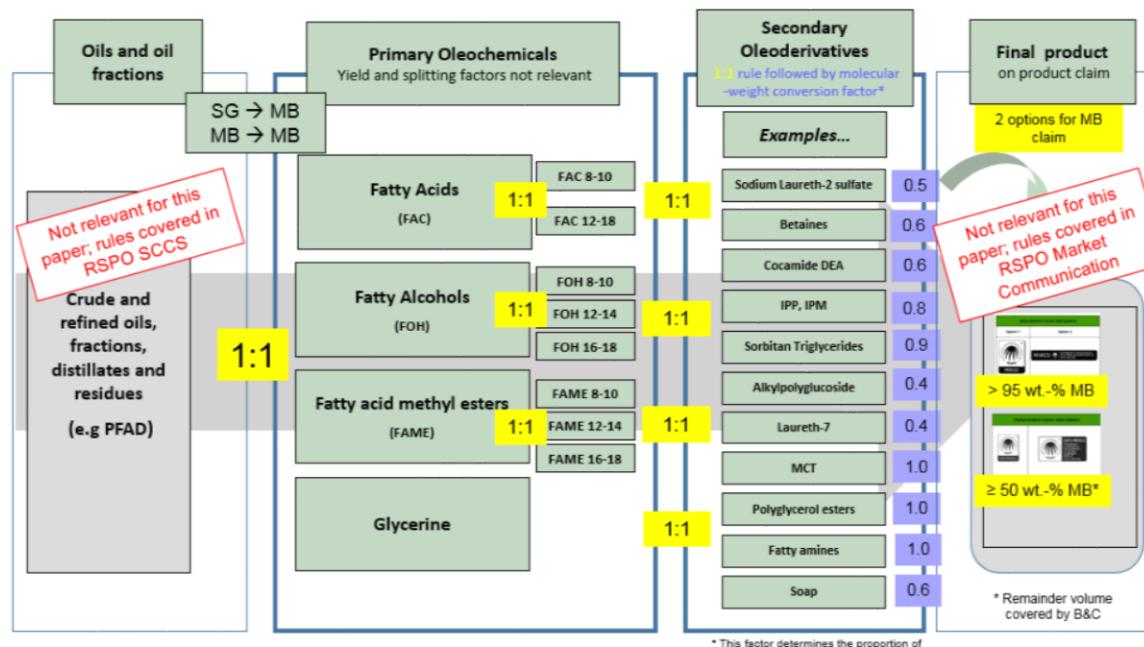
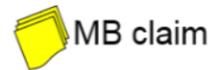
### 4.2.1 1:1 rule

For **Primary Oleochemicals from palm kernel oil, its fractions, distillates or residue products in scope** the 1:1 rule shall apply (**see graph 2**) as their molecular weight does not differ significantly from the precursor oil.

For glycerine, not having a precursor identity nor a C-chain reference, the 1:1 rule shall apply as well.

For **Secondary Oleoderivatives in scope** the 1:1 rule shall apply followed by the product calculation factors based on the molecular weight based conversion factors as guideline (non - mandatory) with possibility of using actual yields (see table 4). In the case where a Secondary Oleoderivative product conversion factor is not (yet) covered in the existing document already, the guidelines under 4.4. shall apply.

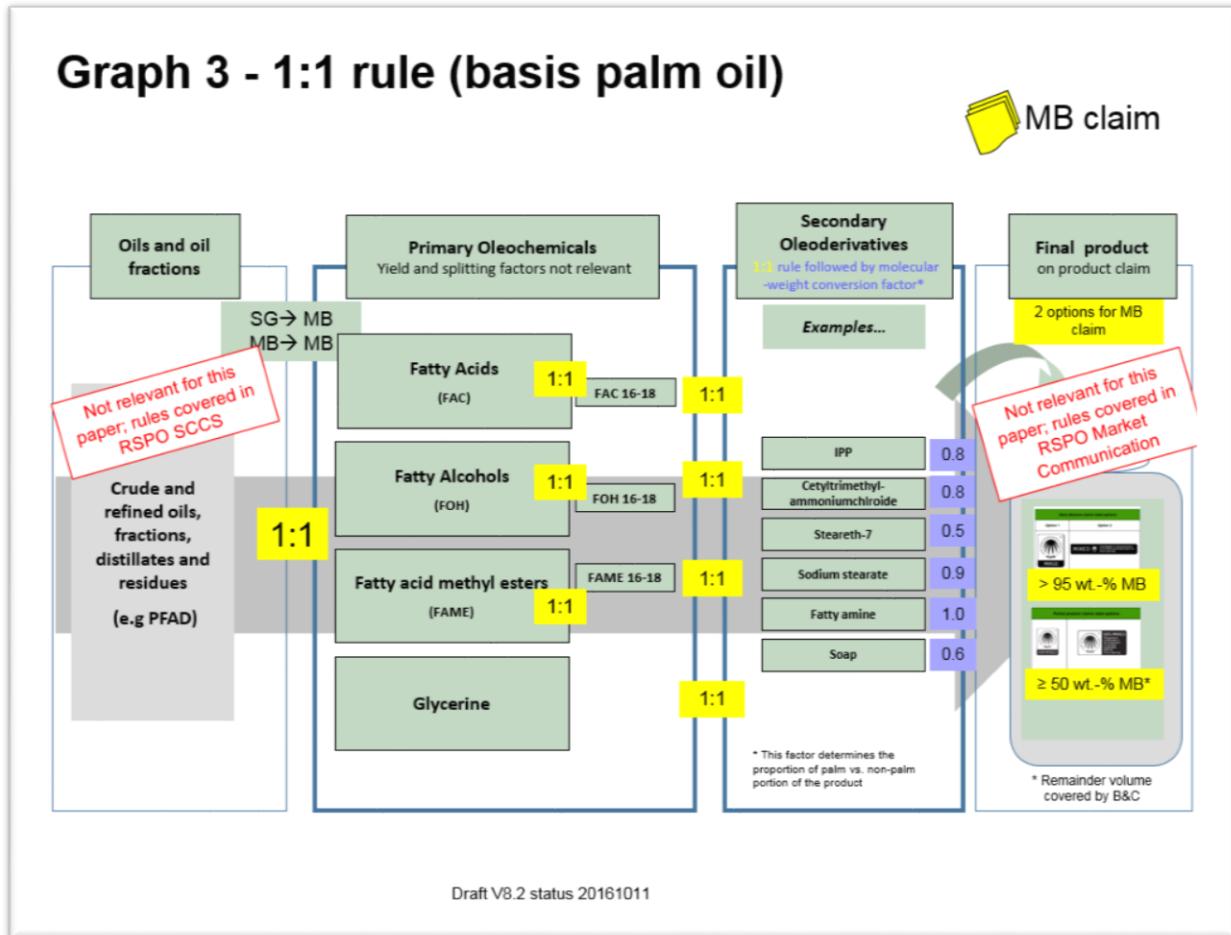
## Graph 2 - 1:1 rule (basis palm kernel oil)



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**Primary Oleochemicals as well as Secondary Oleoderivatives** made from **palm oil, its fractions, distillates or residue products** (see graph 3) are limited due to carbon chain length pre-conditions (see table 2), nevertheless the same logic shall apply.

In the case of soap base (made either from oil saponification or fatty acid neutralization), oil requirement should be based largely on the total fatty matter content, which is affected by the soap noodles' moisture content. The conversion factor is that for soap noodles with moisture content 18% and below a conversion factor of 0.7 should be applied and for soap noodles with moisture content above 18% a conversion factor of 0.6 should be applied.

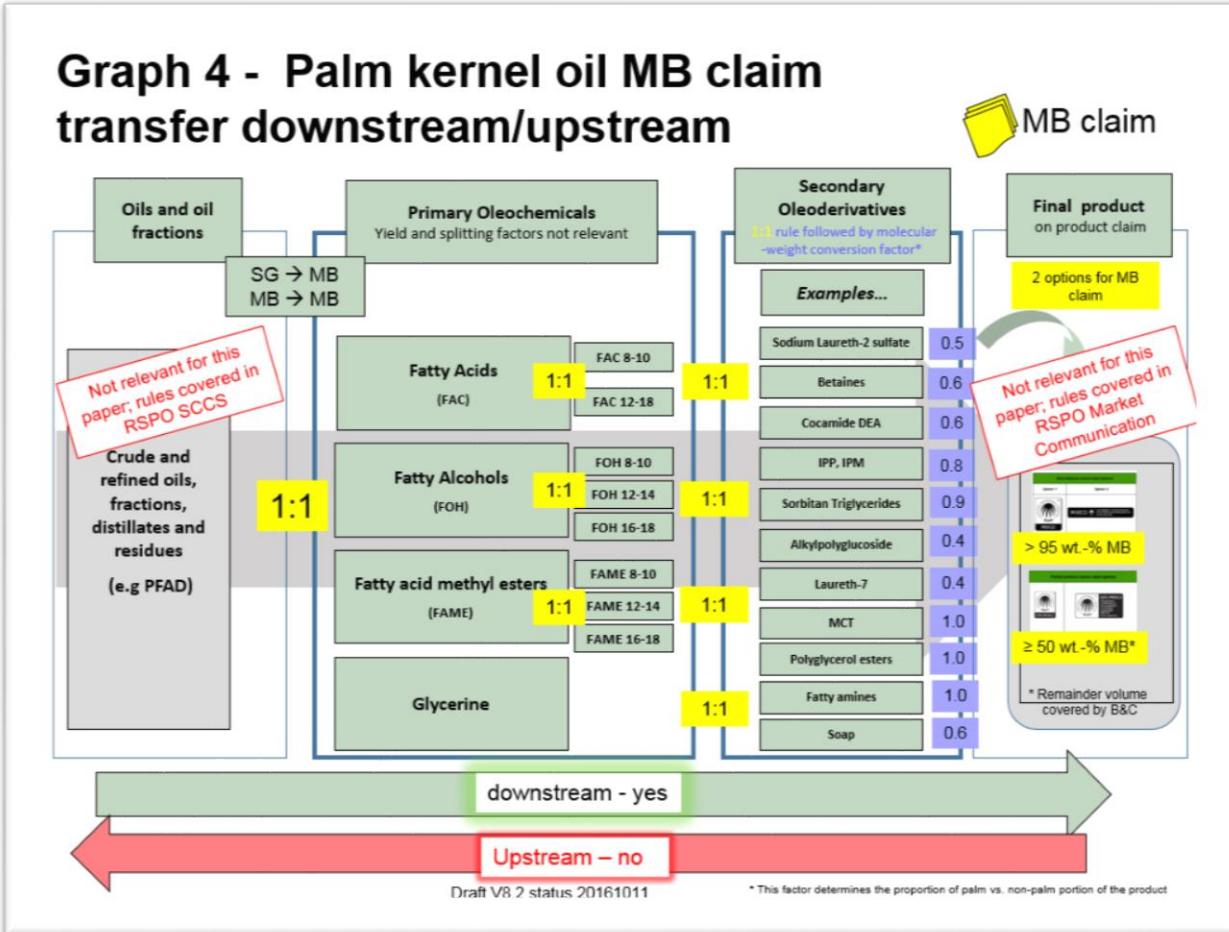


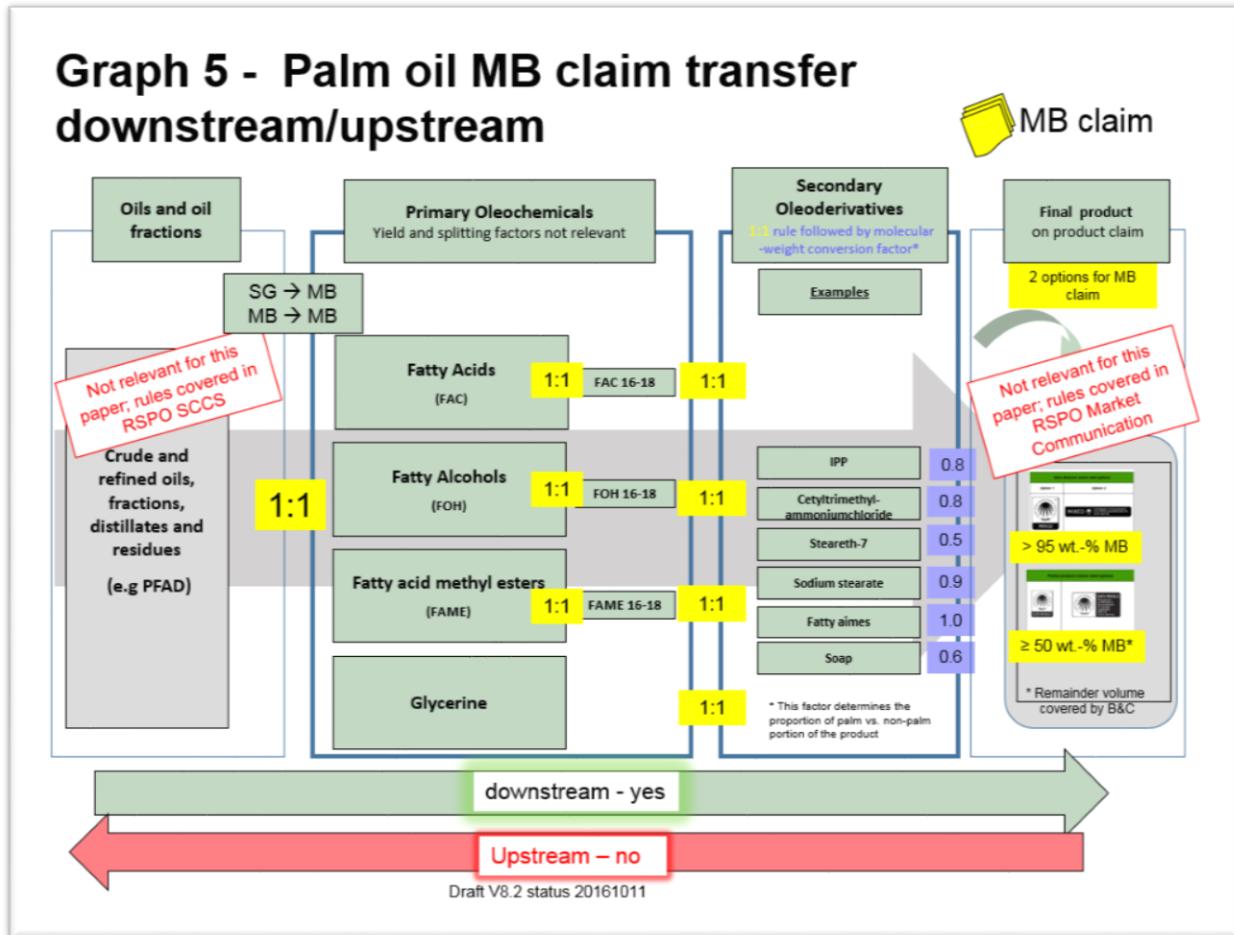
#### 4.2.2 MB claim transfer downstream/upstream

For **Primary Oleochemicals and Secondary Oleoderivatives made from palm kernel oil, its fractions, distillates or residue products** in scope a MB claim transfer can only be applied downstream (see graph 4).

The same rule applies for those **limited Primary Oleochemicals and Secondary Oleoderivatives made from palm oil** (see graph 5).

For example a downstream MB - claim transfer from e.g a fatty acid to a betaine shall be allowed. A MB – claim transfer upstream from e.g. fatty alcohol back to palm kernel oil or from a betaine upstream to a fatty acid shall not be allowed.



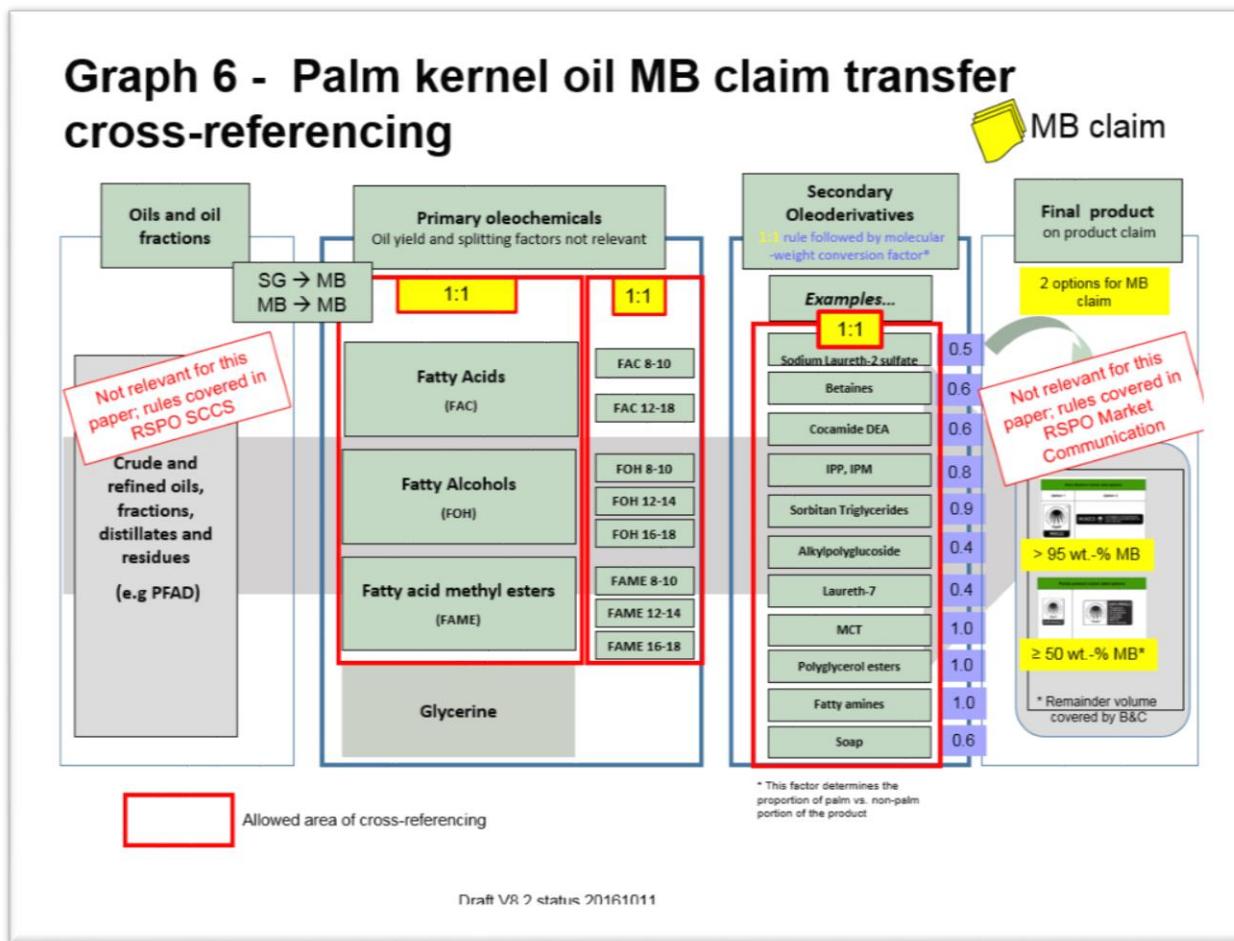


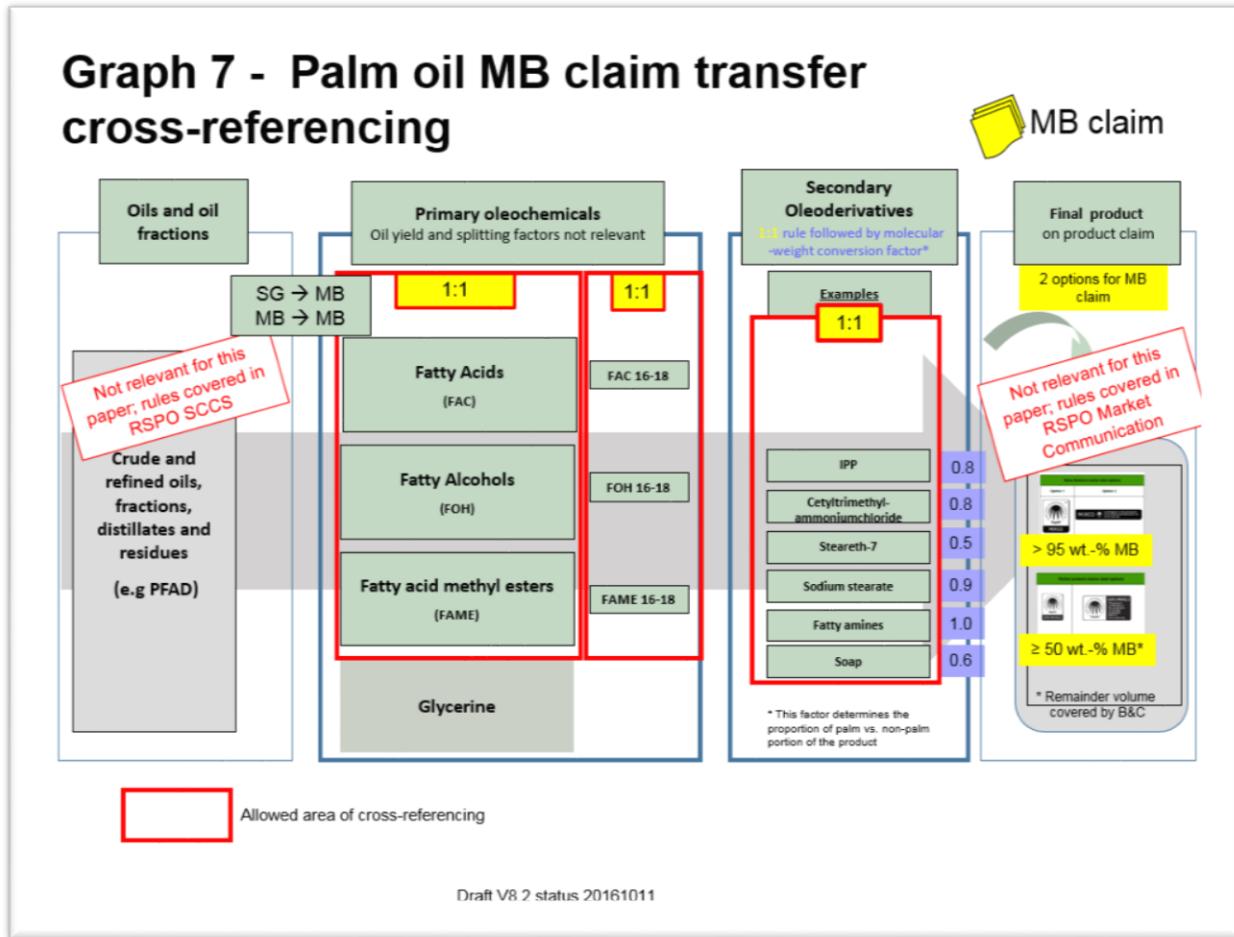
#### 4.2.3 MB claim transfer cross referencing

The **transfer of a MB claim inside a specified section** as marked in red (see graph 6) is allowed. For example, from a fatty acid to a fatty alcohol or from a sodium laureth - 2 sulfate to a betaine shall be allowed. Glycerine is excluded from cross-referencing as glycerine neither has a precursor identity nor a C-chain reference.

The same rule applies for those **limited Primary Oleochemicals and Secondary Oleoderivatives made from palm oil** (see graph 7).

## Graph 6 - Palm kernel oil MB claim transfer cross-referencing





#### 4.3 RSPO Credits / Book & Claim

The B&C calculation for Primary Oleochemicals and Secondary Oleoderivatives in scope (see graph 1) shall use the standard conversion factors as given in table 4 as guidance (non - mandatory) with possibility of using actual yields.

In the case where a Secondary Oleo derivative product conversion factor is not (yet) covered in the existing document already, the guidelines for calculation under 4.4. (see graph 9) shall apply.

#### 4.3 Guiding principle to calculate Secondary Oleo derivative conversion factors

All calculated product conversion factors can be found in table 4.

In case a Secondary Oleochemical conversion factor is not (yet) covered in table 4, the **guiding structure as shown in graph 9** shall apply to establish the correct conversion factor.

New factors should be reported to the RSPO for verification and inclusion in the subsequent review of this document. The conversion factors may act as guidelines in the case of SG products where the actual physical yield will be used.

## Graph 9 – determination of new secondary oleoderivative conversion factors

This factor determines the proportion of palm vs. non-palm portion of the product based on molecular weight. In the case where a product conversion factor is not covered in the existing document yet, the guideline to establish the product conversion factor is listed below.

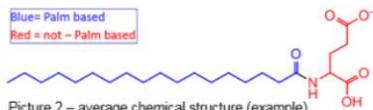
1. Split product into components (until all reactants are identified)
2. Investigate origin of reactants (whether palm, palm kernel oil, fractions or residues or not)
3. Define average chemical structure of the product (see picture 2)
4. Apply molecular weight calculation (see picture 1)
5. Calculate ratio palm-based vs. not palm-based for single components (see picture 3)
6. Calculate total amount of palm-based in composition (see picture 3)

$$M_r = \text{molecular weight}$$

$$\% \text{ Palm} = \frac{M_r \text{ (Based on palm)}}{M_r \text{ Entire molecule}} \cdot 100$$

Picture 1 – molecular weight calculation

Blue = Palm based  
Red = not – Palm based



Picture 2 – average chemical structure (example)

Example - Product composition contains 30 % PKO

20% Component A (0% PKO)

20% Component B (100% PKO)

20% Component C (50% PKO)

40% Water (0% PKO)

PKO(Formulation) = 0.2 · 0% + 0.2 · 100% + 0.2 · 50% + 0.4 · 0%

A B C D

Picture 3 – calculation of a composition (example)

## Annex

### 1. Tables

**Table 1 – Products in scope (C-Chain C6 – C18)**

<b>Primary Oleochemicals</b>	Fatty acids Fatty acid methyl esters Fatty alcohols Glycerine	
<b>Secondary Oleoderivatives</b>  (examples, not exclusive)	Alkylpolyglucosides Caprylic/Capric Triglycerides (e.g. MCT) Cetyltrimethylammonium Chloride Cocamide DEA Cocamide MEA	

Cocoamidopropyl Betaine Fatty Isethionate (e.g. Sodium Cocyl Isethionate) Glycerol Esters (mono-,di-, and triglycerides) Isopropylester (e.g. IPM, IPP) Laureth-7 Polyglycol Esters Sodium Laureth-1 Sulfate Sodium Laureth-2 Sulfate Sodium Laureth-3 Sulfate Sodium Lauryl Sulfate Sodium Palm Kernelate Sodium Stearate Sorbitan Monoglycerides Sorbitan Triglycerides Stearamidopropyltrimethylamine Polysorbate 60 (ethoxylated SMS), Polysorbate 80 (ethoxylated SMO) Polysorbate 65 (ethoxylated STS) Propylene Glycol Monoester stearate	
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**Table 2 – MPOB carbon chain length guideline**

C - Chain	Palm kernel oil	Palm oil	Palm stearine	Palm olein
C6	0.5	-	-	-
C8	4.5	-	-	-
C10	3.5	-	-	-
C12	48.5	0.1	0.3	0.3
C14	15.5	1.0	1.5	1.0
C16	8	44.0	62.4	40.2
C18	2	4.4	5.0	4.4
C18:1	15	40.1	24.9	42.8
C18:2	2.5	10.4	5.9	11.3

**Table 3a - SG and IP C-chain calculation factors for fatty acids**

(Remark: 0.87 is the yield factor for fatty acids; the other calculation factor is derived from table 2 with the C-chain length guideline)

Fatty Acid with C- chain from C6 to C14	Target Fraction (1 mt)	PO - Based		PKO - Based	
		PO - Based	PKO - Based	SG (IP) - certified PKO needed (in mt)	Calculation
C6				229.9	$[(1/0.87)/0.005]$
C8				25.5	$[(1/0.87)/0.045]$
C10				32.8	$[(1/0.87)/0.035]$
C12				2.4	$[(1/0.87)/0.485]$
C14				7.4	$[(1/0.87)/0.155]$
C8-10				14.4	$[(1/0.87)/0.08]$
C12-14				1.8	$[(1/0.87)/0.64]$

Fatty Acid with C-chain from C16 to C18	Target Fraction (1 mt)	SG (IP) - certified PO needed (in mt)	Calculation	SG (IP) - certified PKO needed (in mt)	Calculation
C16	2.6	$[(1/0.87)/0.44]$	14.4	$[(1/0.87)/0.08]$	
C18	2.1	$[(1/0.87)/0.55]$	5.7	$[(1/0.87)/0.20]$	
C16-18	1.2	$[(1/0.87)/0.99]$	4.1	$[(1/0.87)/0.28]$	
Palm or palm kernel oleic acid		2.1	$[(1/0.87)/0.51]$	5.7	$[(1/0.87)/0.18]$

**Table 3b - SG and IP C-chain calculation factors for fatty alcohols**

(Remark: 0.83 is the yield factor for fatty alcohols; the other calculation factor is derived from table 2 with the C-chain length guideline)

		PO - Based		PKO - Based	
		Target Fraction (1 mt)		SG (IP) - certified PKO needed (in mt)	Calculation
Fatty Alcohols with C-chain from C6 to C14	C6			241.0	$[(1/0.83)/0.005]$
	C8			26.8	$[(1/0.83)/0.045]$
	C10			34.4	$[(1/0.83)/0.035]$
	C12			2.5	$[(1/0.83)/0.485]$
	C14			7.8	$[(1/0.83)/0.155]$
	C8-10			15.1	$[(1/0.83)/0.08]$
	C12-14			1.9	$[(1/0.83)/0.64]$
Fatty Alcohols with C-chain from C16 to C18	Target Fraction (1 mt)	SG (IP) - certified PO needed (in mt)	Calculation	SG (IP) - certified PKO needed (in mt)	Calculation
	C16	2.7	$[(1/0.83)/0.44]$	15.1	$[(1/0.83)/0.08]$
	C18	2.2	$[(1/0.83)/0.55]$	6.0	$[(1/0.83)/0.20]$
	C16-18	1.2	$[(1/0.83)/0.99]$	4.3	$[(1/0.83)/0.28]$

**Table 4 – Conversion factors for Primary Oleochemicals and Secondary Oleoderivatives (based on material at 100 % active (excluding water/solvent)**

Index	Primary Oleochemicals	Factor*
1	Fatty acids	1.0
2	Fatty alcohols	1.0
3	Fatty methyl esters	1.0
4	Glycerine	1.0
	Secondary Oleoderivative (INCI or chemical name)	Factor
5	Cocoamidopropyl Betaine	0.6
6	Fatty amines	1.0
7	Sodium Lauryl Sulfate	0.7
8	Sodium Laureth-1 Sulfate	0.6

9	Sodium Laureth-2 Sulfate	0.5
10	Sodium Laureth-3 Sulfate	0.5
11	Sodium Stearate	0.9
12	Sodium Palm Kernelate	0.9
13	Laureth-7	0.4
14	Steareth-7	0.5
15	Cocamide MEA	0.8
16	Cocamide DEA	0.6
17	Stearamidopropyl dimethylamine	0.7
18	Cetyltrimethylammonium chloride	0.8
19	Isopropyl Esters (e.g. IPP, IPM)	0.8
20	Caprylic / Capric Triglyceride (e.g. MCT)	1.0
21	Fatty Isethionate (e.g. Sodium Cocyl Isethionate)	0.6
22	Alkypolyglycoside	0.4
23	Glycerolesters (Mono-, Di and Triglycerides)	1.0
24	Polyglycerol Ester	1.0
25	Sorbitan Monoglyceride	0.7
26	Sorbitan Triglyceride	0.9
27	Polysorbate 60 (ethoxilated SMS), Polysorbate 80 (ethoxilated SMO)	0.2
28	Polysorbate 65 (ethoxilated STS)	0.5
29	Propylene Glycol Monoester	0.9
30	Lactylated Monoglyceride	0.8
31	Metallic salts of Lactic esters of Fatty acids (Sodium Stearyl Lactylate, Calcium Stearyl Lactylate)	0.6
32	Acylated Monoglyceride	0.9
33	Succinylated Monoglyceride	0.8
34	Ethoxylated Monoglyceride (Polyglycerate 60)	0.8
35	Sucrose esters of fatty acids	0.5
36	Diacetyl tartaric acid ester of monoglycerides (DATEM)	0.6
37	Monoglyceride citrate	0.7
38	Stearoyl Lactylic Acid	0.7
39	Stearyl Tartrate	0.4
40	Sodium Stearyl Fumarate	0.7
41	Carboxylic Acid Soap	0.9
42	N-Butyl Esters	0.8
43	2-Ethyl Hexyl Esters	0.7
44	TMP Esters (TMP C8-C10 triester)	0.5
45	Ethylene Glycol Monoesters (EGMS)	0.9
46	Ethylene Glycol Diesters (EGDS)	0.9

\* palm or palmkernel oil – precursor equivalent present in 1 mt of Primary Oleochemical or Secondary Oleoderivative product.

## 2. Questions and Answers

The RSPO T&T oleoderivatives sub-group is collecting issues and is answering them in building consensus among experts. The more frequently asked and/or key questions are addressed below.

**1. Which C-Chain components can be manufactured from which oil, with reference to palm oil and palm kernel oil?**

The feedstock identification is based on the MPOB carbon chain length guideline. Having identified the appropriate feedstock from the C-chain table, the rules will be applied accordingly. For example: Mass Balance C6-C14 products can only be produced from palm kernel oil, C16-C18 can be made from both palm oil or palm kernel oil. Due to the interchangeability of feedstocks for some oleoderivatives, the choice of feedstock shall be determined by the manufacturer.

**2. Is there a 1:1 rule for connecting MB supply chain models, e.g. MB oils towards MB oleoderivatives?**

Yes. The RSPO Rules for Physical Transition does allow for this linkage especially for Primary Oleochemicals and its Secondary Oleoderivatives (see chapter 4.2.1).

**3. Can MB Oleic Acid be derived from PKO or PO?**

Yes. The feedstock identification is based on the MPOB carbon chain length guideline and oleic acid can be derived from both oils.

**4. Is the common practice to apply a cross oil / FAC reference where SG oil may be purchased for FAC components used in downstream derivative operation in line with the SCC rules? And is then applying the 1:1 ruling also in line with the SCC logic?**

Yes. Sites can purchase a certain volume or weight of identity preserved or segregated sustainable palm oil and palm kernel oil products and use it to match the sales of equal volumes of palm product derivatives that then carry a mass balance credit without requiring a physical or chemical link between the acquired segregated product and the derivative that is sold under mass balance (see RSPO SCCS C 6.3).

**5. Is it allowed to convert MB acids to MB fatty alcohols (e.g. C8-18 acids to C12-14 alcohols) by applying the 1:1 rule?**

Yes. If the feedstock identification based on the MPOB carbon chain length guideline allows this and if the MB-claim transfer rule (see chapter 4.2.2) is applied.

**6. Is it allowed to convert MB acids (e.g. C12-18) to MB acids (e.g. C8-18) by applying the 1:1 rule?**

Yes. If the feedstock identification based on the MPOB carbon chain length guideline allows this and if the MB-claim transfer rule (see chapter 4.2.2) is applied.

**7. Is it allowed to balance out any MB oleo product on stock (starting materials) in a fixed inventory period vs. another MB oleo product (selling products) using the 1:1 rule as per RSPO guidance?**

Yes. If the organization shall ensure that the quantity of RSPO mass balance material inputs and outputs (volume or weight) are balanced within a fixed inventory period which does not exceed 3 (three) months (see RSPO SCCS C 5.1 ff) and if the MB-claim transfer rule (see chapter 4.2.2) is applied.

**8. Is it allowed to cover a negative stock of RSPO MB oleoderivative (product A) with a product B where there is no chemical / physical link between them and/or which has (i.e.) different origin?**

No. If a Product A and a Product B are not linked chemically / physically (e.g. PKO-based with PO-based) and / or which have different origin, this is not allowed. The MB-claim transfer rule (see chapter 4.2.2) shall apply as well.

**9. Is it allowed to transfer 1MT CPKO RSPO MB credits to 1MT RSPO MB fatty acids without the chemical/physical link between them?**

Yes. If the MB-claim transfer rule (see chapter 4.2.2) is applied and only as long as the fatty acids are derived from the same source, namely PKO.

**10. Is it allowed to transfer RSPO MB credits from CPO to stearic acids or methyl esters (derived from CPO)?**

Yes. This transition is allowed as long as both credits are derived from palm oil and if the MB-claim transfer rule (see chapter 4.2.2) is applied.

**11. How to deal with the interchangeability of lauric oils (coconut oil and palm kernel oil) to produce oleoderivatives?**

Partial CNO content in formulations is neutral for any MB volume schemes; nevertheless member may be able to sell the percentage content they buy as PKO. Alternatively, refer to public website where the production volumes for PKO and CNO can be found. (*For example the "Oil World Annual, ISTA Mielke" statistics the global coconut – palm kernel oil production ratio.*)

**12. Is eTrace relevant for downstream operations in oleochemicals?**

No. Oleochemical (primary or secondary) are currently still excluded from etrace.

**13. Can one switch glycerin RSPO MB certificates to stearic acid 45% when both materials are made from same source?**

Yes. The transition this is allowed as long as both materials are derived from PO..

**14. Can one switch RSPO MB credits of any fatty acid made from palm stearine to a product made from palm stearine based raw material?**

Yes. The transition is allowed as long as the fatty acids are derived from palm oil and if the MB-claim transfer rule (see chapter 4.2.2) is applied.

**15. Can MB oleo products convert MB credit to other MB oleo products, if they use same MB materials?**

Yes. The 1:1 transition is allowed as long as the oleoderivatives are made from the same oil and if the MB-claim transfer rule (see chapter 4.2.2) is applied.



Roundtable on Sustainable Palm Oil

The RSPO is an international non-profit organization 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.



**RSPO will transform markets to make sustainable palm oil the norm**

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