

# **Palm Oil Functionality and Versatility in Finished Food Products**

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Mewah R&D Solution

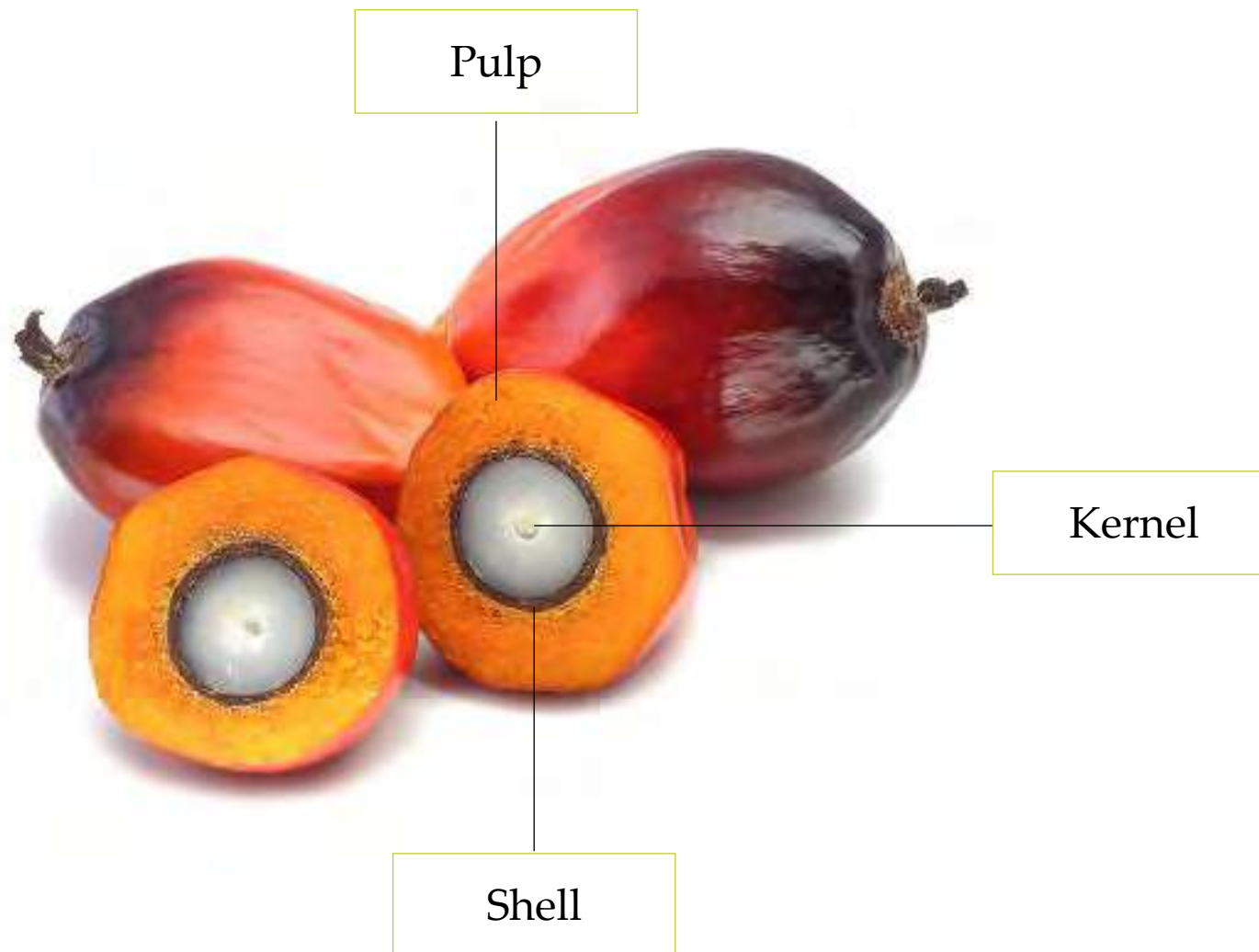
# Overview

- More than 3 billion people in 150 countries consume palm oil as a major source of dietary fat making it the most consumed edible oil in the world.
- It is also a major ingredient in the production of cosmetics, pharmaceutical and nutraceutical products.
- Palm oil is rich in minor components that impart unique nutritional properties.
- Palm oil is a good candidate for the multi-step dry fractionation process, aiming to the production of commodity oils and specialty fats.
- Very limited oils has this kind of broad functionality and versatile application.
- Most popular non trans solution globally.

# Palm Fruit

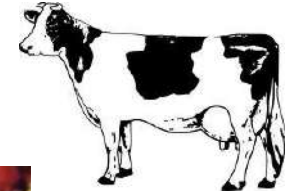


Fresh fruit  
bunches



# Sources of Oil/Fats

- Oil-bearing fruits, nuts and seeds
- Largest source: seeds of annual plants
- By-products of other sources (e.g. maize germ)
- Oil-bearing trees such as coconut, palm, palm kernel, olive
- **Animal Sources:** tallow and lard
- **Fish Sources:** cod, tuna, salmon, herring



Soybean

Sunflower

Cottonseed

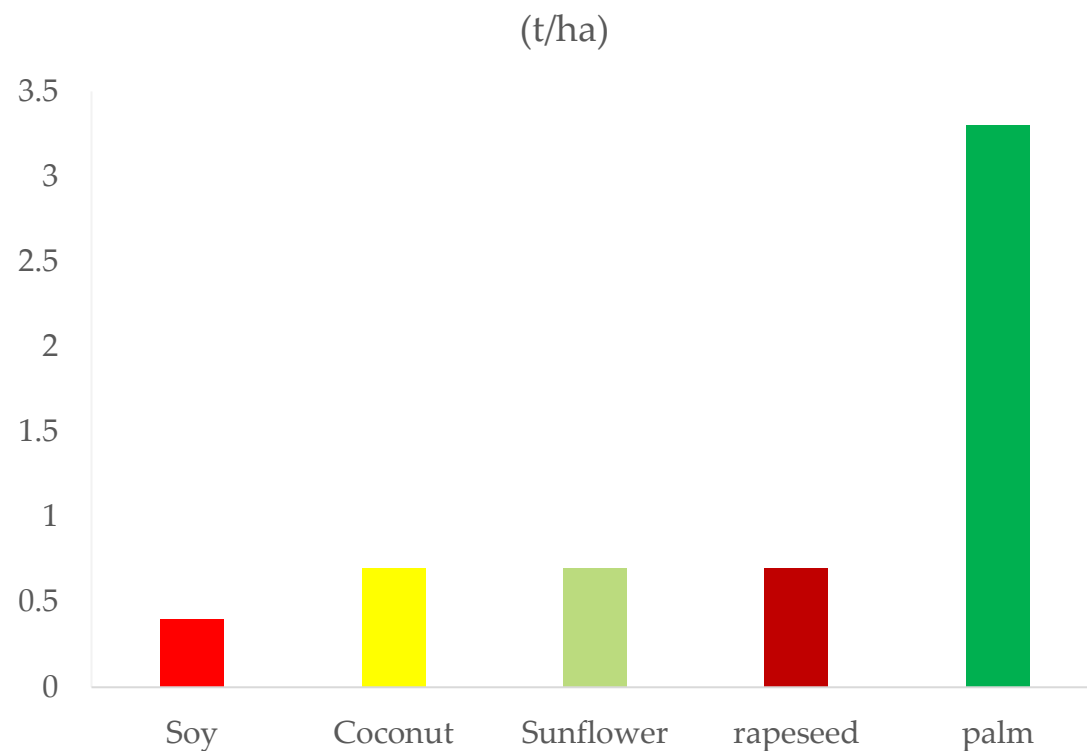


Canola



Palm

# Global Oil Yield by Crop and Oil Content in Seed



## Oil Seed

- Canola
- Coconut
- Corn
- Cottonseed
- Olive
- **Palm Oil**
- Palm Kernel
- Peanut
- Safflower
- Soybean
- Sunflower

## Oil Content (%)

- 40 to 45
- 65 to 68
- 3 to 6
- 18 to 20
- 25 to 30
- 35 to 45**
- 45 to 50
- 45 to 50
- 30 to 35
- 18 to 20
- 35 to 45

# Saturated & Unsaturated fats

## Rapeseed Oil

- 93% Unsaturated
- 7% Saturated

## Sunflower Oil

- 90% Unsaturated
- 10% Saturated

## Coconut Oil

- 8% Unsaturated
- 92% Saturated

## Soybean Oil

- 84% Unsaturated
- 16% Saturated

## Palm Oil

- 50% Unsaturated
- 50% Saturated

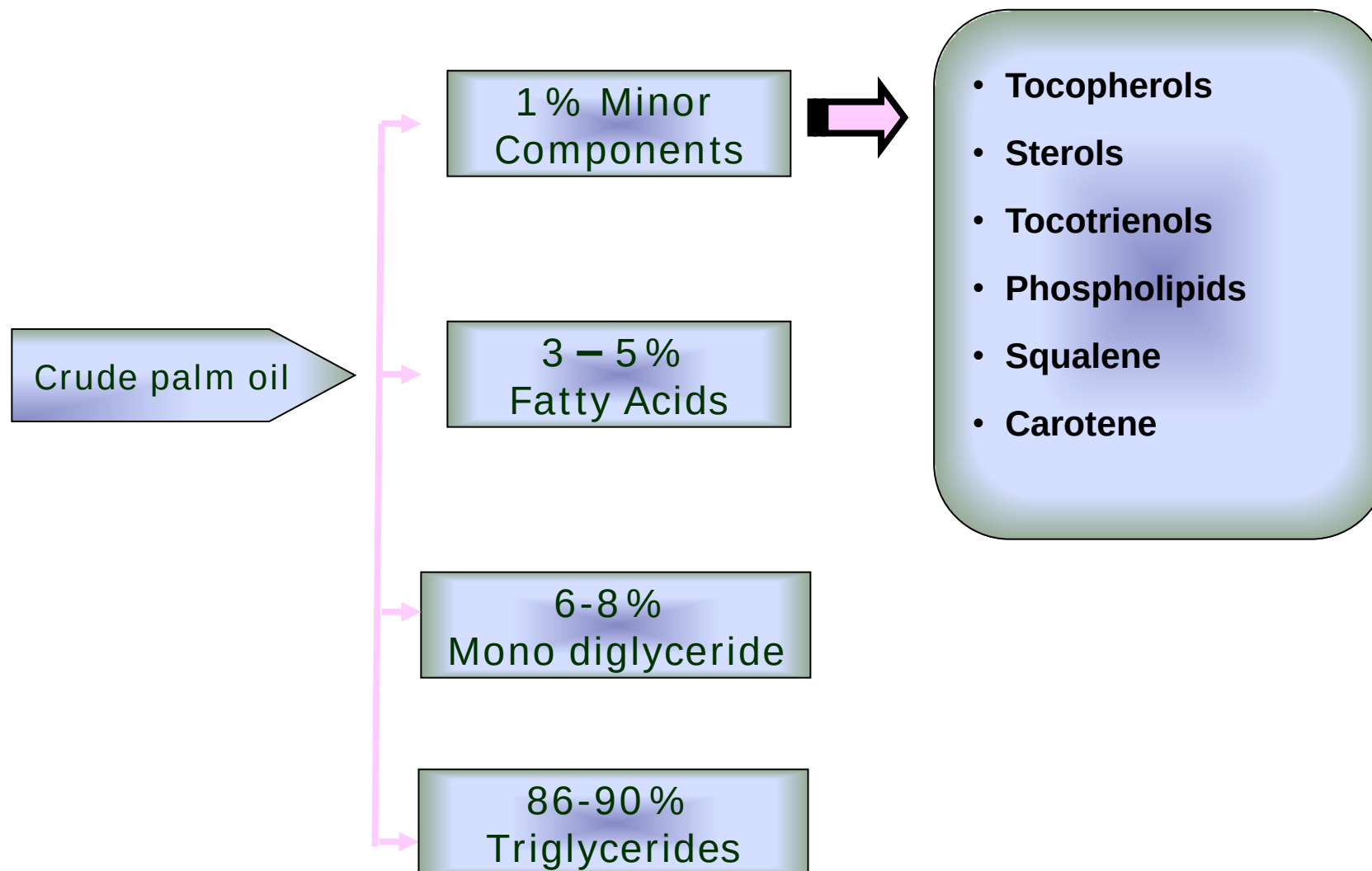
## Olive Oil

- 85% Unsaturated
- 15% Saturated



This is unique properties of palm oil. Most of oil does not have this properties.

# Make-Up of Fats and Oils



# Why Palm Oil Considered Versatile

- High stability to oxidation
- Hard without hydrogenation
- Trans free solution
- Stability in the beta prime crystalline form
- Ready and increasing availability world-wide
- Competitive price and cost effective solution
- Nutritional attributes of palm oil
- Valuable feedstock for enzymatic interesterification (low-trans margarines, shortenings, specialty fat, infant formula)
- Alternative to replace animal fat

# Major Triacylglycerols (TAG) of Palm Oil

| TAG     | Carbon Number | %    | Melting points |         |
|---------|---------------|------|----------------|---------|
|         |               |      | $\beta'$       | $\beta$ |
| POL     | 52            | 9.9  | -              | -       |
| PPL     | 50            | 9.0  | 26.5           | -       |
| OOO     | 54            | 5.5  | -10            | 4.8     |
| POO     | 52            | 25.6 | -              | 18.5    |
| PPO/POP | 50            | 29.9 | 34.6           | -       |
| PPP     | 48            | 4.7  | 55.7           | 65.9    |
| SOO     | 54            | 2.9  | -              | 23.5    |
| PSO     | 52            | 5.4  | 40             | -       |

In general, palm oil tends to display  $\beta'$  form, which is desirable for shortenings and margarine production for polymorphic stability.

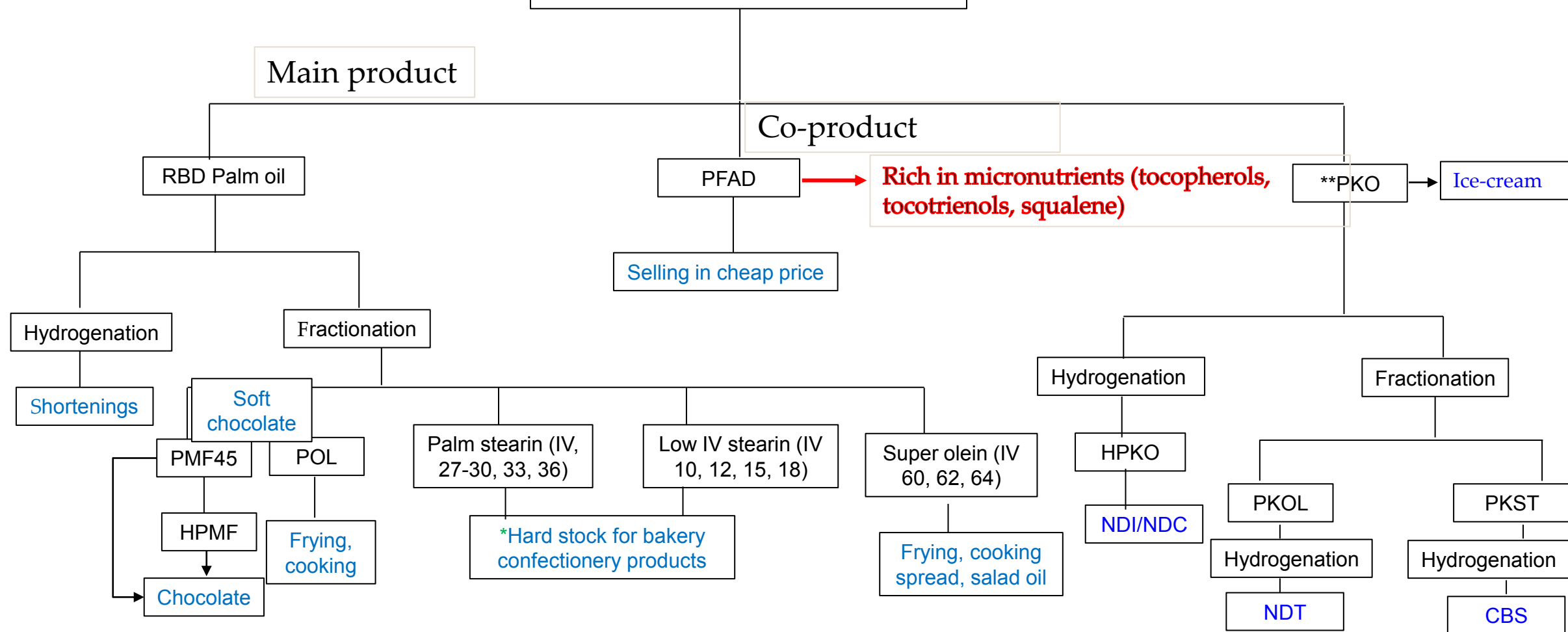
# Modification of Oils and Fats

- Most of natural fats and oils shows limited application in their original state, due to their particular fatty acid and triacylglycerol (TAG) composition. They can be modified to improve their usage and performance in the application.

## Methods of modification:

|                                                                                                           |                                                                                                |                                                                                              |                 |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------|
| <b>Interesterification</b> <ul style="list-style-type: none"><li>- chemical</li><li>- enzymatic</li></ul> | <b>Hydrogenation</b> <ul style="list-style-type: none"><li>- fully</li><li>- partial</li></ul> | <b>Fractionation</b> <ul style="list-style-type: none"><li>- Dry</li><li>- Solvent</li></ul> | <b>Blending</b> |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------|

# Crude Palm Oil



# Application of Palm Oil and Its Fraction

**Palm oil:** SMP 38-42°C

Application: [bakery fat](#) , [biscuit fat](#), [food service](#) and [frying](#)

**Hydrogenated palm oil:** SMP 42-65°C

Application: [Distilled emulsifiers](#), [flakes](#), [powder fat](#)

**Palm olein:** SMP 20°C

Application: [snack food manufacture](#), [cooking oils](#), [frying](#)

**Hydrogenated palm olein:** SMP 38-42°C

Application: [Dairy fat alternatives](#)

**Palm stearin:** SMP 48°C

Application: [Pastry fat](#), [margarines](#), [soap manufacture](#)

IE palm oil: SMP 42, [dairy mixes](#)

IE palm olein: SMP 38, [confectionery filling](#), [biscuit filling](#)

IE palm stearin: SMP 50, [Flaked fat](#), [pizza dough](#)

**Super olein** SMP 10°C

Application: [Food service frying oil](#)

**Hydrogenated super olein:** SMP 36°C

Application: [confectionery filling](#)

**Palm mid fraction:** SMP 25-30°C

Application: [Confectionery filling](#), [bakery filling](#), [raw material for CBE](#)

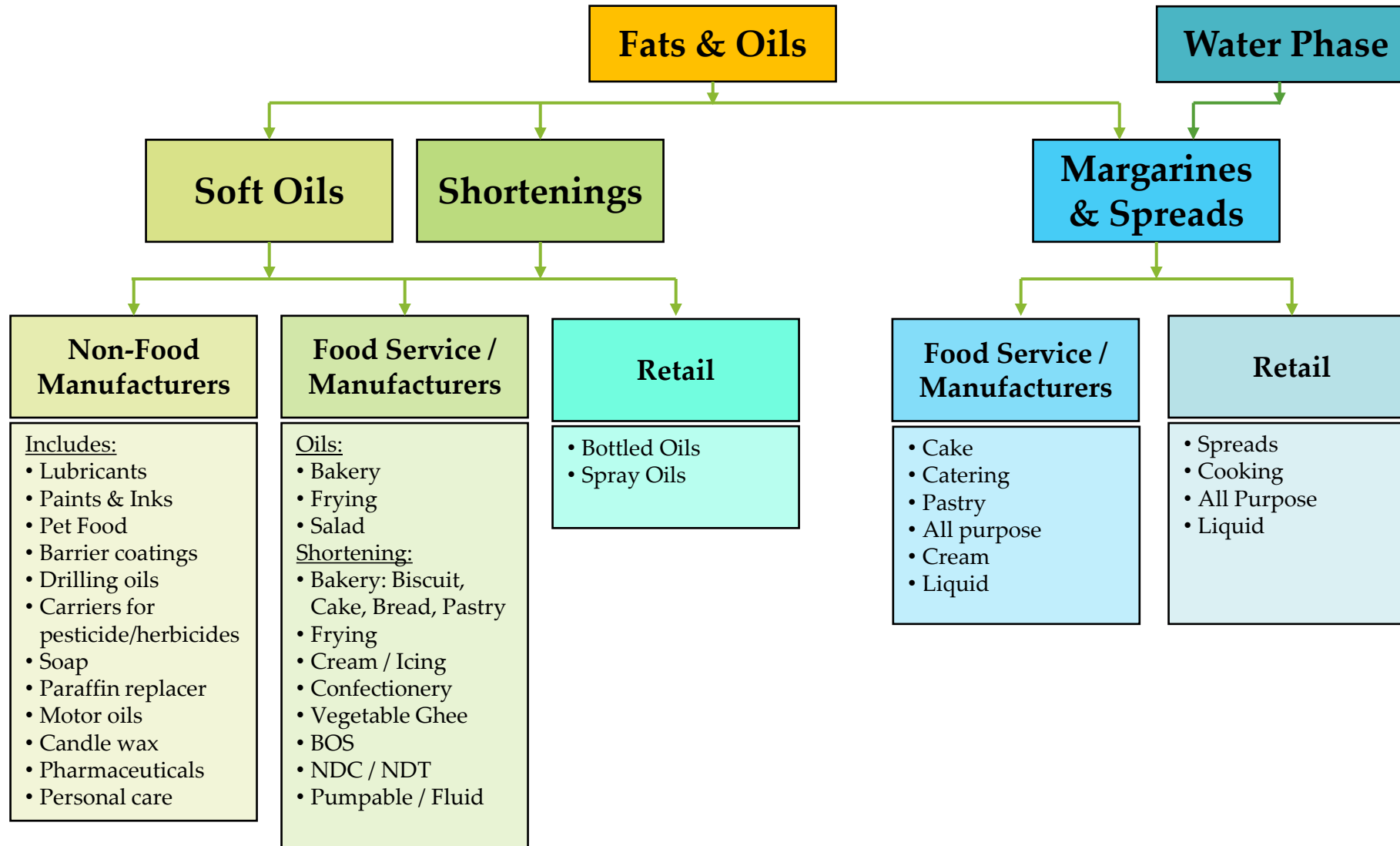
**Palm mid stearin:** SMP 30°C

Application: [hard stock for margarines](#)

**Palm super stearin:** SMP:58-62°C

Application: [hard stock for hydro replacement](#)

# Industrial Application



# Cocoa Butter Alternatives

## Cocoa Butter Equivalent

Source

Non lauric (**PMF**, Exotic fat)

Temper

Chocolate tempering is required

Soapy

No soapy flavor/taste

CB

Fully compatible

Process

Fractionation; Blending; EIE

## Cocoa Butter Substitute

Source

Lauric (**HPKST**)

Temper

Chocolate tempering is not required

Soapy

Risk of soapy flavor/taste

CB

Low compatibility, up to 5% CB

Process

Fractionation; Hydrogenation

## Cocoa Butter Replacer

Source

**\*Non lauric (PST)**

Temper

Non-temper

Soapy

No soapy flavor/taste

CB

Partially compatible, up to 20% max CB

Process

Hydrogenation and/or Fractionation, IE



# Confectionery Finished Products



# Bakery Finished Products



# Food Uses of Palm Oil Products

| Products                  | Palm oil | Palm olein | Palm stearin (soft) | Palm stearin (hard) | Hardened palm oil | D. F. Palm oil | PMF | PKO |
|---------------------------|----------|------------|---------------------|---------------------|-------------------|----------------|-----|-----|
| Shortenings               | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Vanaspati                 | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Margarines                | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Frying fats               | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Cooking oil               | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Specialty fat for coating | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Ice-cream                 | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Cookies                   | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Crackers                  | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Instant noodles           | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| <u>Non dairy creamers</u> | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Biscuits                  | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |
| Dough fat                 | ●        | ●          | ●                   | ●                   | ●                 | ●              | ●   | ●   |

● Highly suitable    ● Suitable    ● Minor application only    ● Not suitable

D.F. : double fractionated, PMF: palm mid fraction, PKO: palm kernel oil

<https://www.arabis.org/index.php/articles/articles/marketing/versatility-and-technical-advantages-of-palm-oil>

# Summary

- Palm oil is one of the most globally used oil in various application
- Globally 35% oil supplies with 10% land use
- Even without modification, several finished product can be prepared
- Most versatile melting profile after modification
- Globally competitive price
- Versatile food application
- Major hard stock for various application
- More than 50% packaged products in the supermarkets are from palm oil
- Animal fat alternative

THANK  
YOU!