

# **PALM METHYL ESTERS: SUSTAINABLE AND ENVIRONMENTALLY FRIENDLY FEEDSTOCKS FOR OLEOCHEMICAL AND BIODIESEL INDUSTRIES**

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- Palm methyl ester and sources
- Palm methyl esters & biodiesel
- Development of oleochemicals
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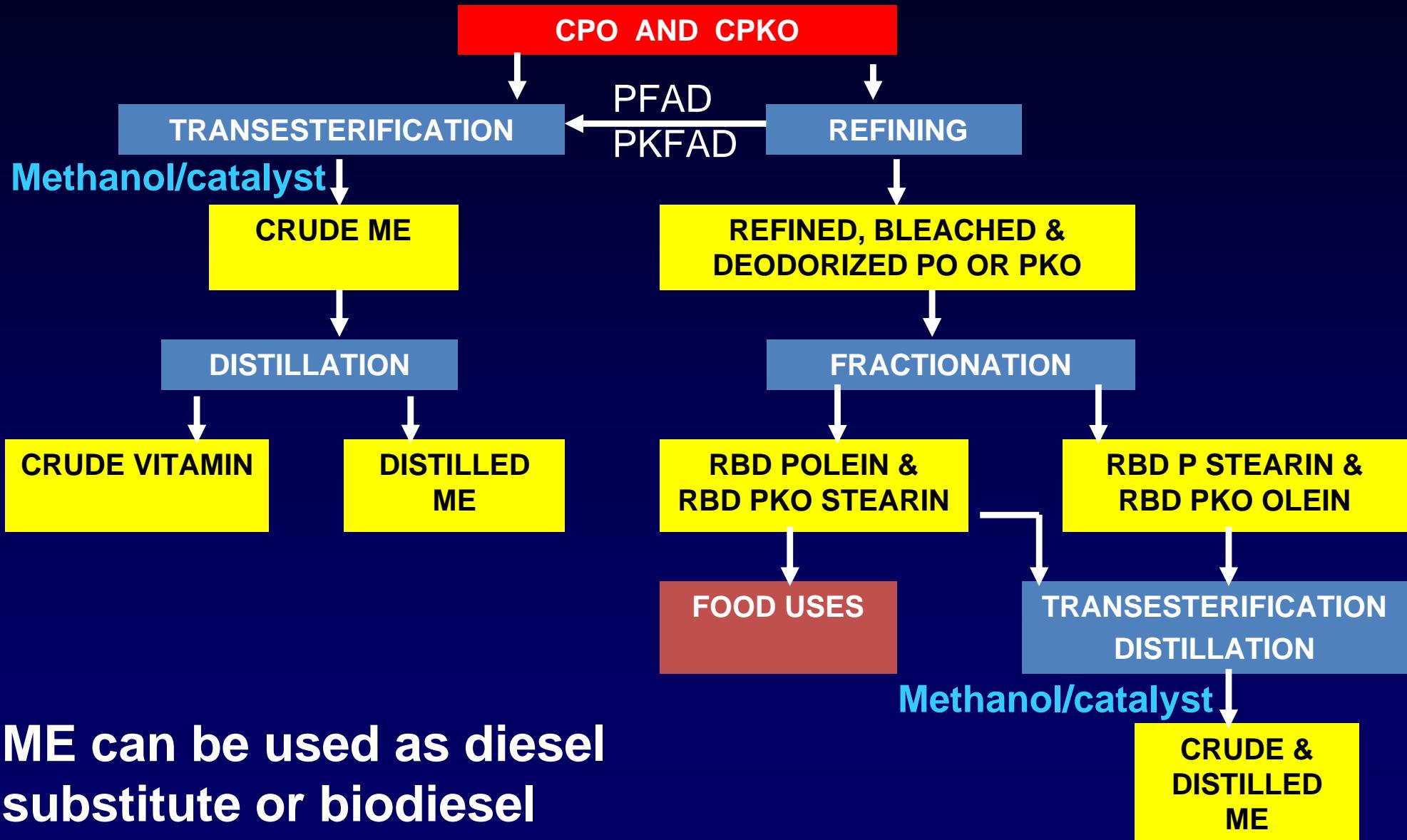
# PALM METHYL ESTER



**Palm Oil – rich in C16 and  
C18 Fatty acids**

**Palm Kernel Oil – rich in C12 and  
C14 Fatty acids**

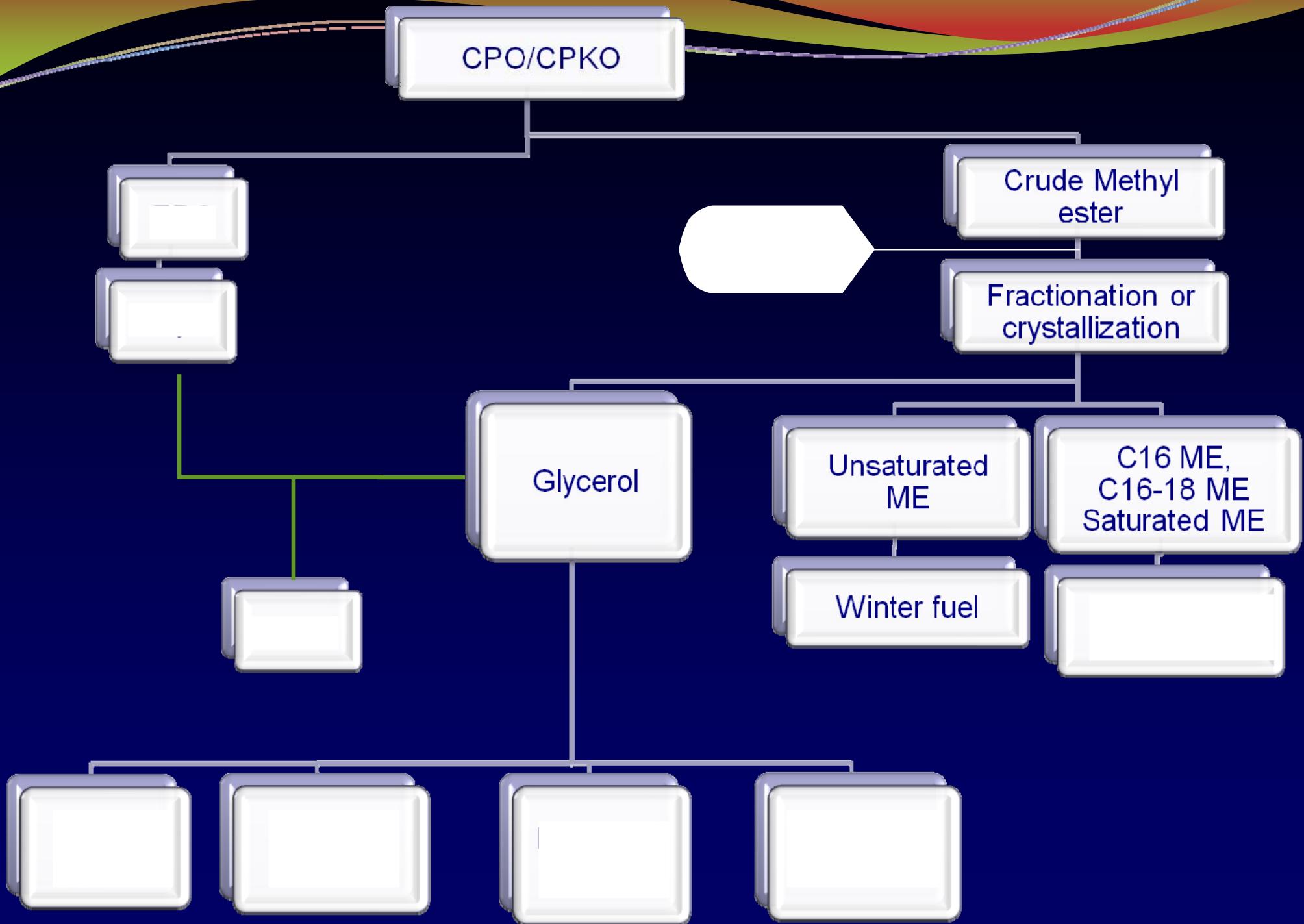
# PROCESSES FOR THE PRODUCTION OF ME



# COMPOSITION IS IMPORTANT

EXPENSIVE

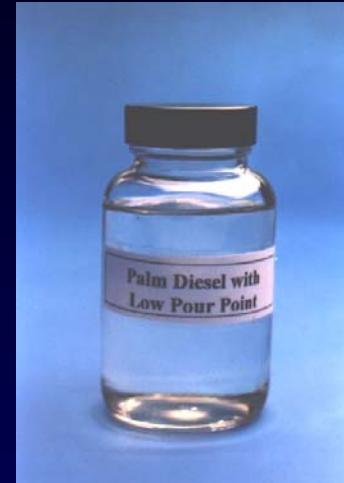
R	PO	PS	Tallow	CNO	PKO
C6				0.2	0.3
C8				8.0	4.4
C10				7.0	3.7
C12	0.23	0.3		48.2	48.3
C14	1.09	1.3	2.5	18.0	15.6
C16	44.02	55.0	26.6	8.5	7.8
C16:1	0.12				
C18	4.54	5.1	21.8	2.3	2.0
C18:1	39.15	29.5	42.8	5.7	15.1
C18:2	10.12	7.4	2.3	2.1	2.7
C18:3	0.37	-			
OTHERS	0.38	0.7	4.0		0.2



# PALM BIODIESEL (METHYL ESTERS)



Crude / Distilled  
Palm Oil Methyl  
Esters)



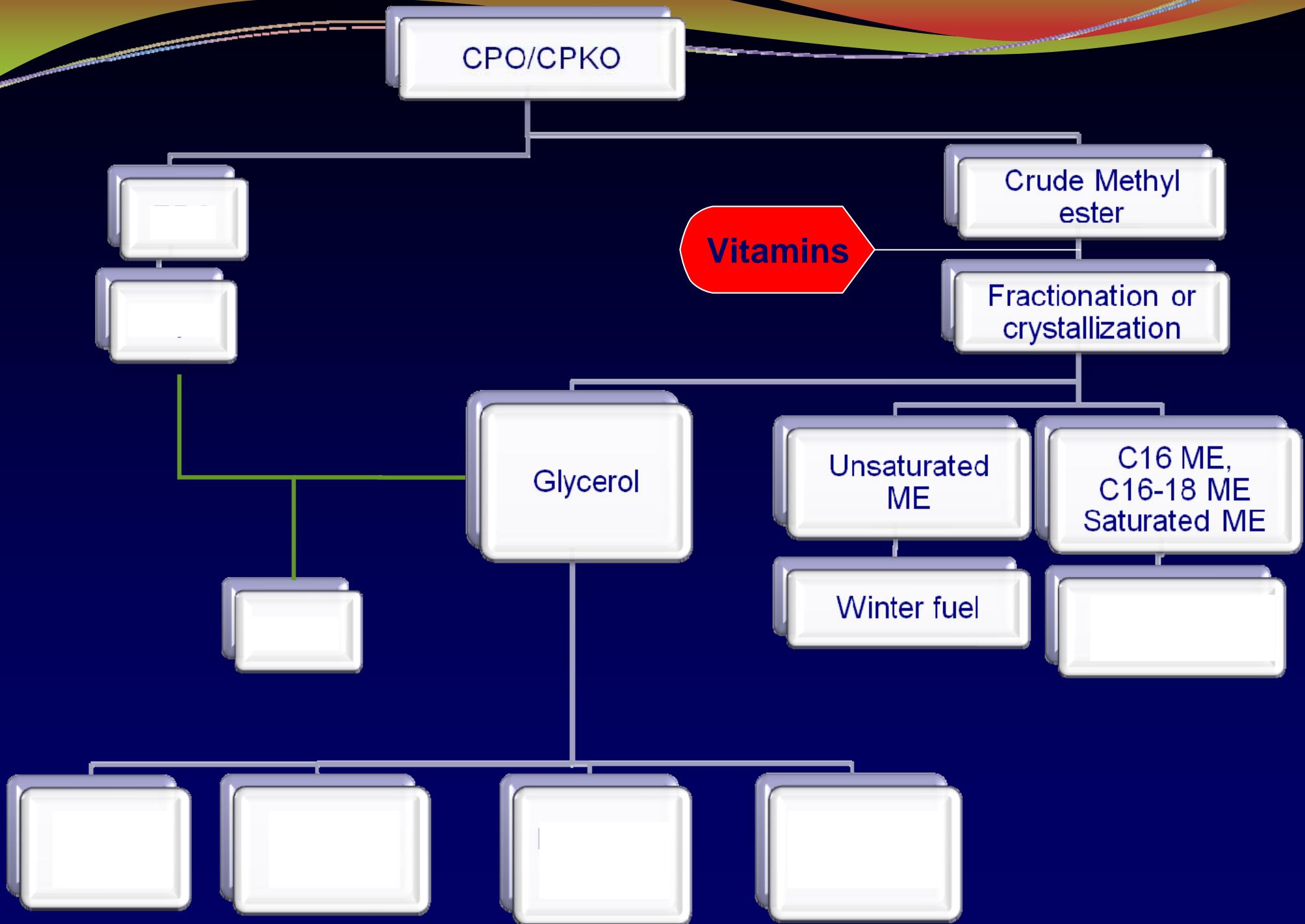
- Low pour point biodiesel – pour point 0°C to -20°C
- 2005: Scaling up to 30,000 TPA
- 2006 : Commercial production



RBD Palm Oil  
Methyl Esters



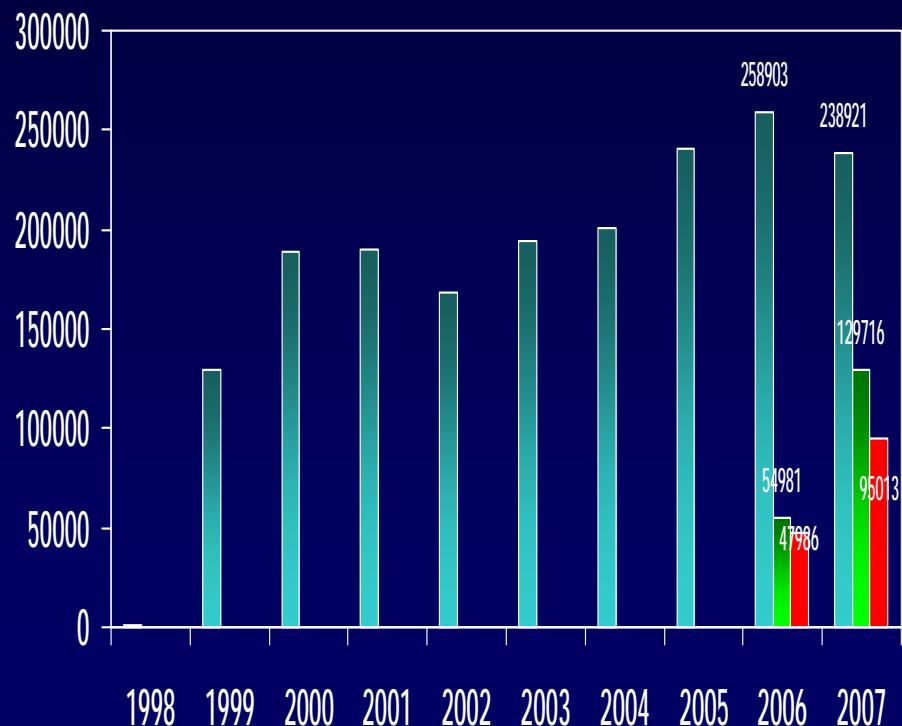
RBD Palm Olein  
Methyl Esters



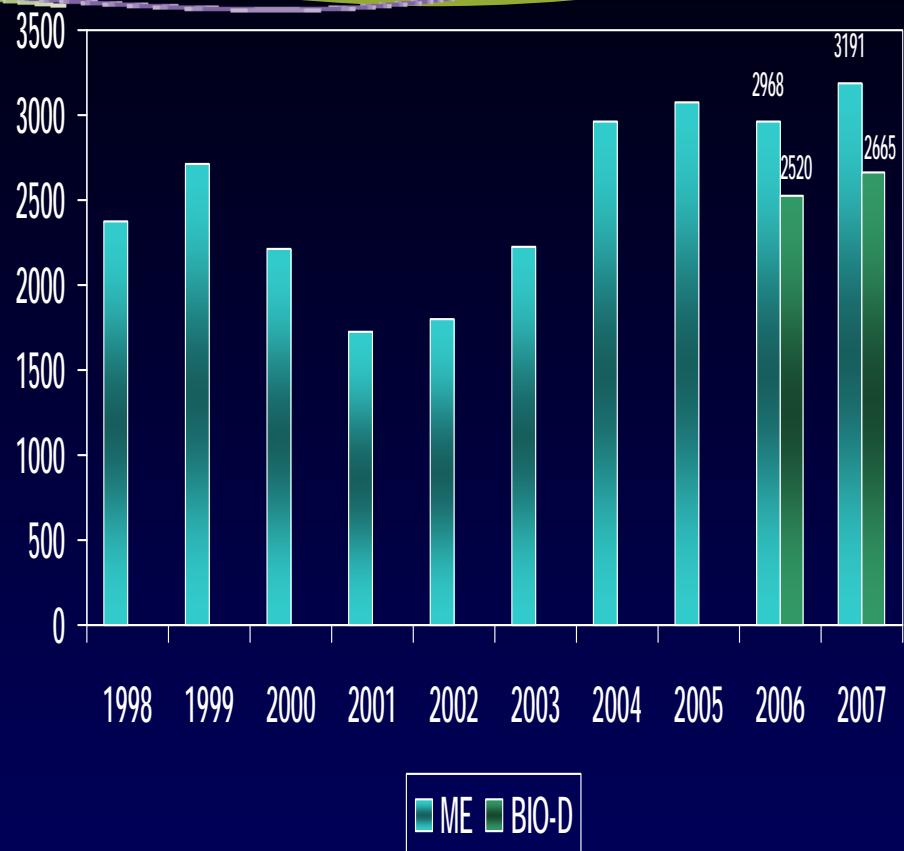
# CAPACITY OF BIODIESEL PLANTS IN MALAYSIA

Biodiesel Plants	Capacity (TPA)
5 Biodiesel Plants in Operation	300,000
4 Biodiesel Plants in Production Trial	272,000
Current capacity in Malaysia	572,000
Addition of 11 Biodiesel	965,000

## EXPORTS OF ME (VOLUME IN TONNES)

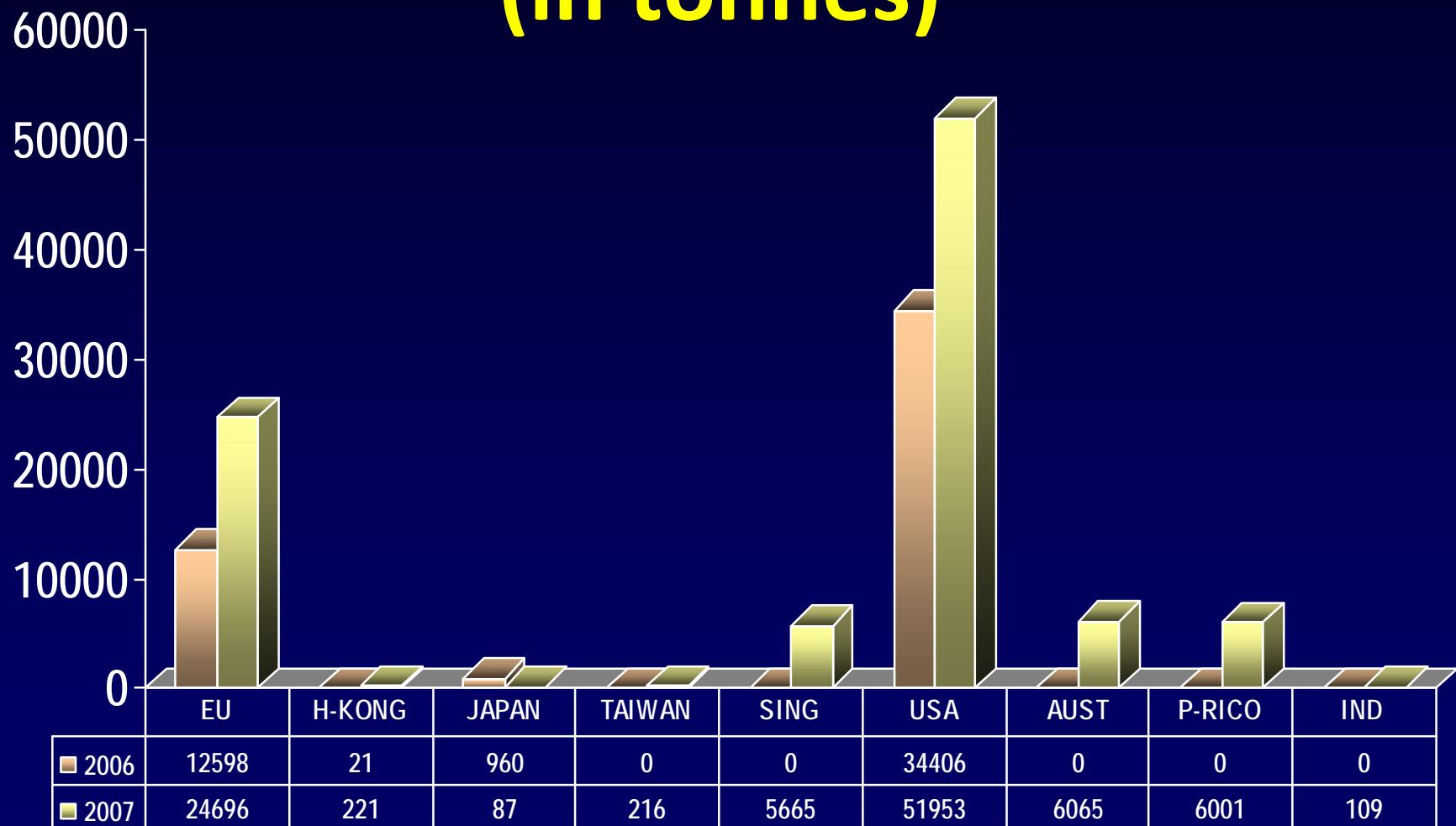


■ ME ■ BIO-D (PRODN) ■ BIO-D (EXP)



## VALUE OF ME EXPORTS (PRICE / TONNE)

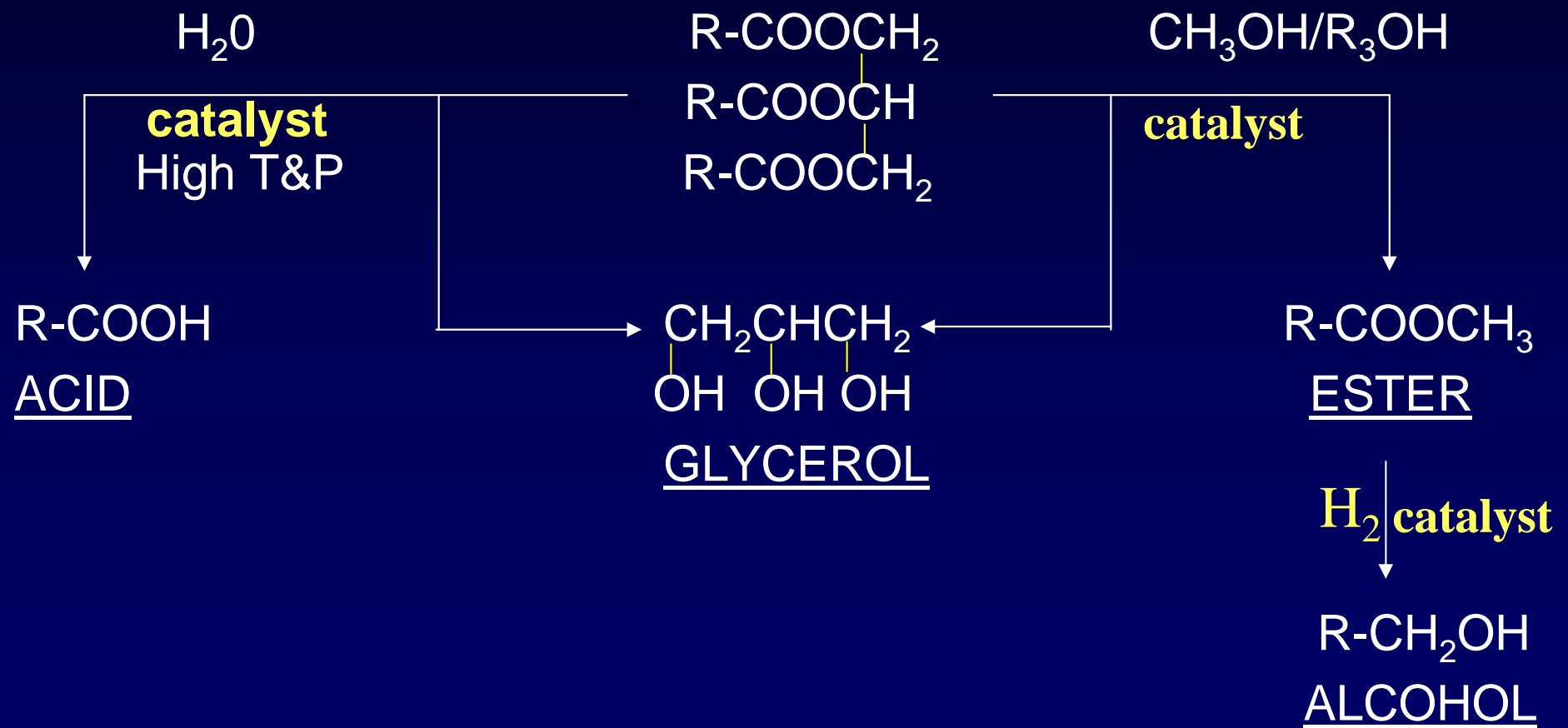
# MAJOR DESTINATION FOR BIODIESEL (in tonnes)



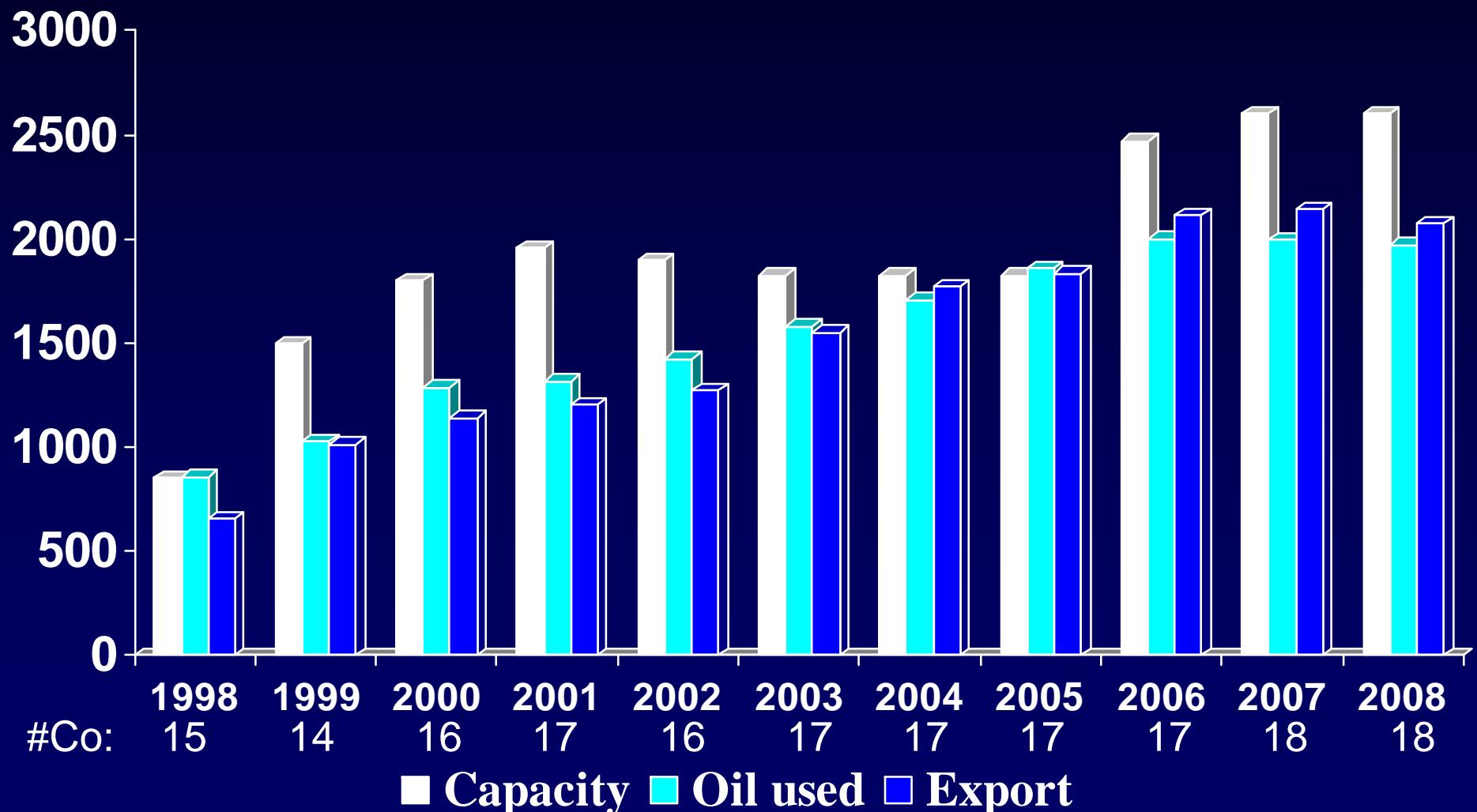
# **BIODIESEL AND PRICE STABILIZATION MECHANISM**

- Diesel consumption in Malaysia – 10 million tonnes
- If 5% -10% substitution – 0.5 -1mil. tonne demand
- Reduce stock
- Increase price
- 70% of cost is feedstock cost → Decrease profitability → subsidy

# BASIC AND *INTERMEDIATE* OLEOCHEMICALS FROM MALAYSIA



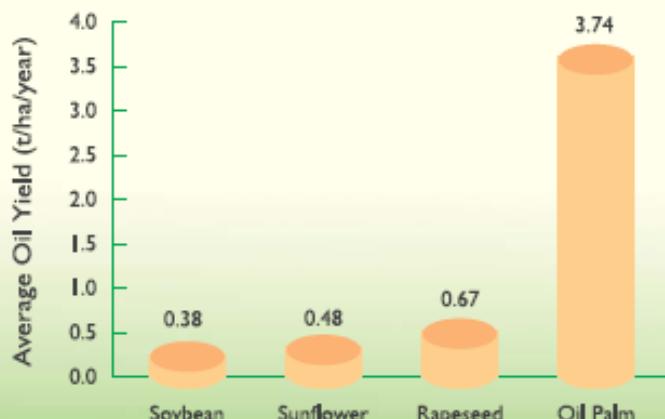
# MALAYSIAN OLEOCHEMICALS: CAPACITY, PRODUCTION AND EXPORTS (in'000 tonnes)



# OLEOCHEMICALS: SUCCESS DUE TO

- Adequate and consistent supply of feedstock
- Complement the food industry in Malaysia
- Environmentally friendly
- Acceptable to all religions and
- Sustainable

**Table 7: Oil Palm vs Other Major Oil Crops**



Source: Oil World (2007)

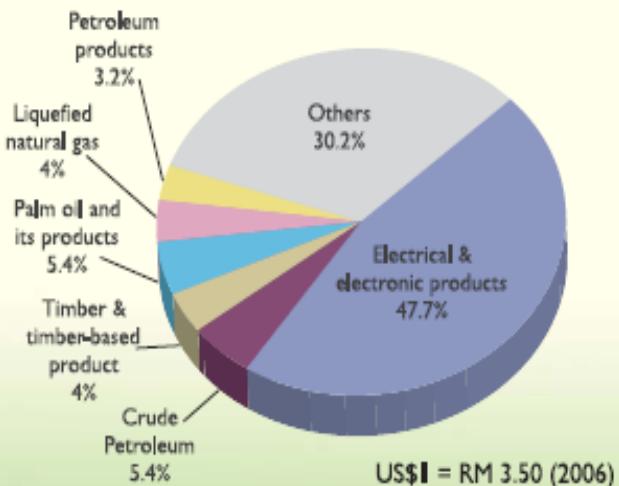
**Table 2: Export Earnings from Malaysian Oil Palm, 1998-2006**



US\$1 = RM 3.67 (2005)

Source: MPOB, 2007

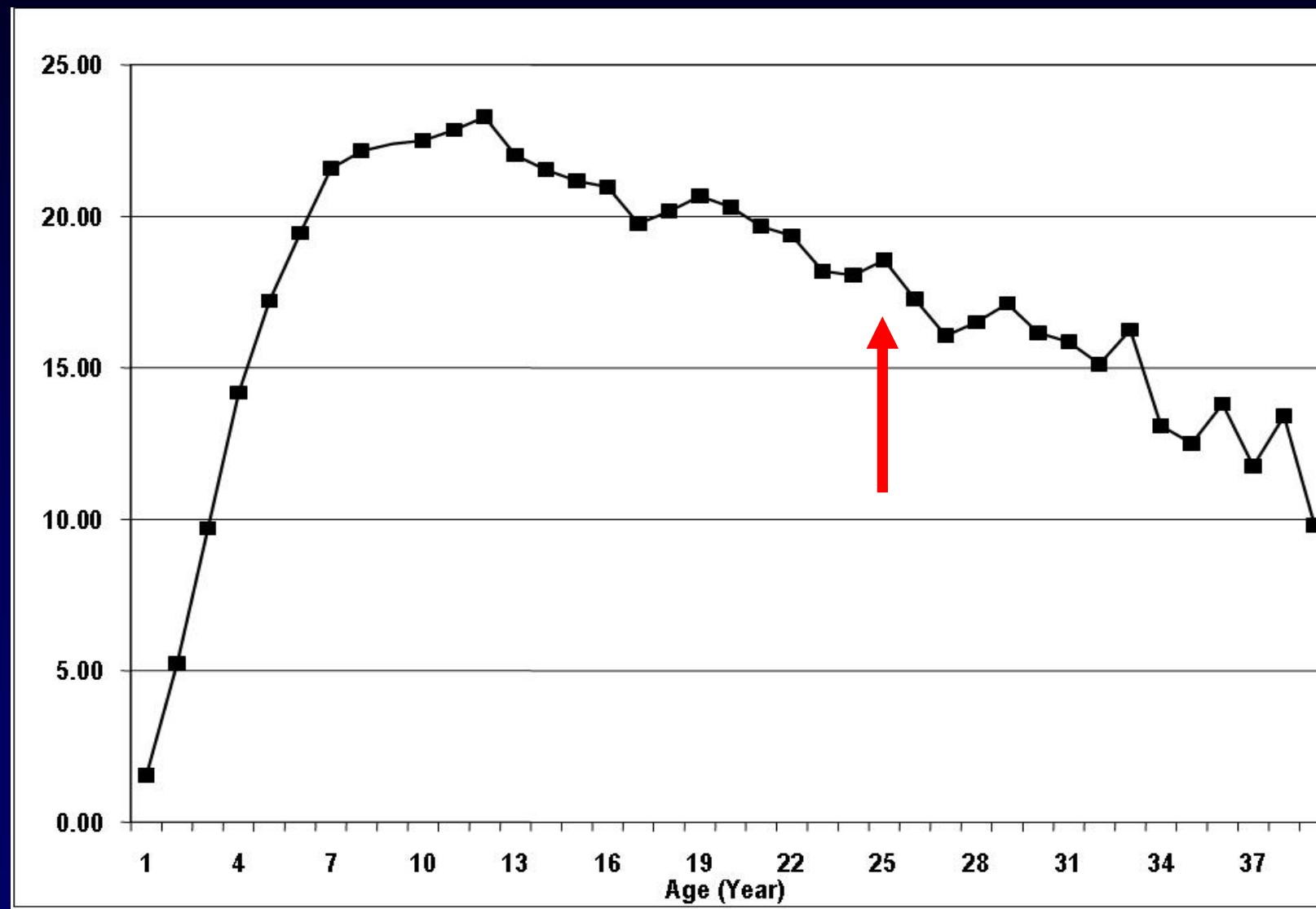
**Chart 4: Malaysia External Trade 2006 (RM bil)**



Total: RM588.9 bil

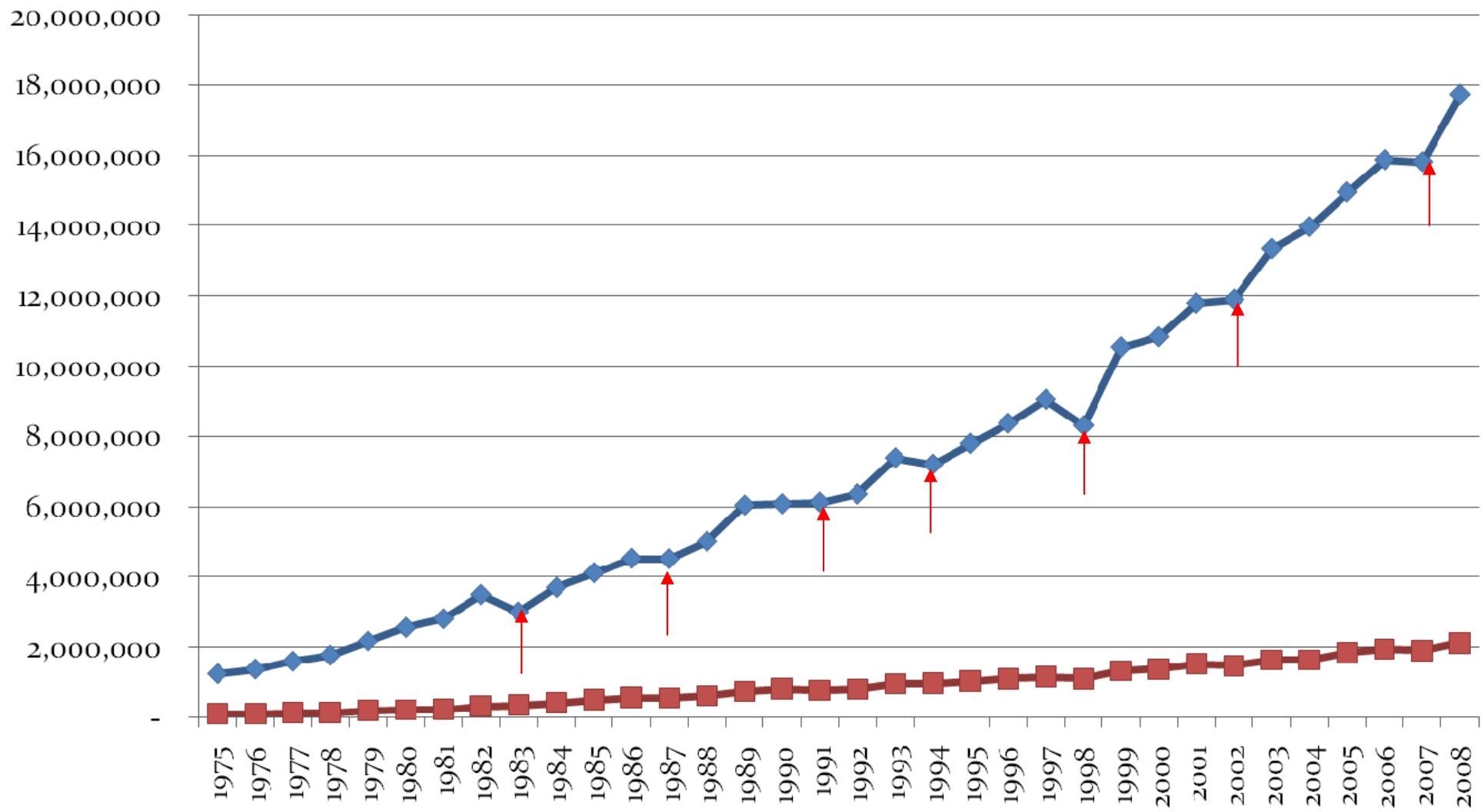
Source: Department of Statistics, Malaysia

# AVERAGE OF MALAYSIAN PALM OIL YIELD

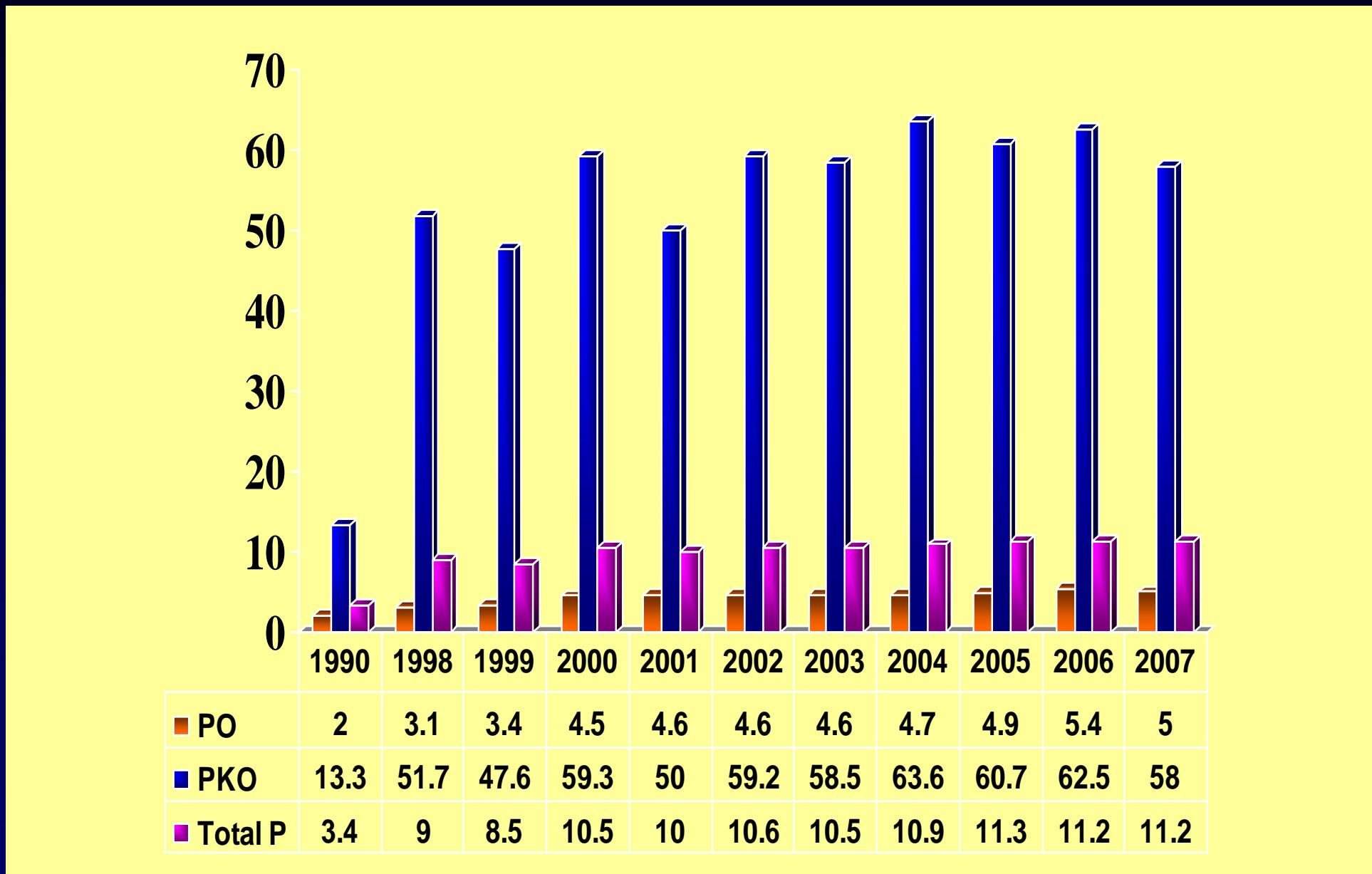


# MALAYSIAN PRODUCTION OF PALM OIL & PALM KERNEL OIL (in tonnes)

◆ Crude Palm Oil      ■ Crude Palm Kernel Oil

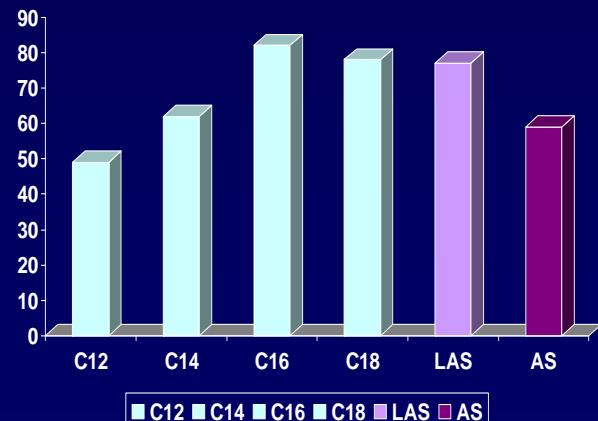
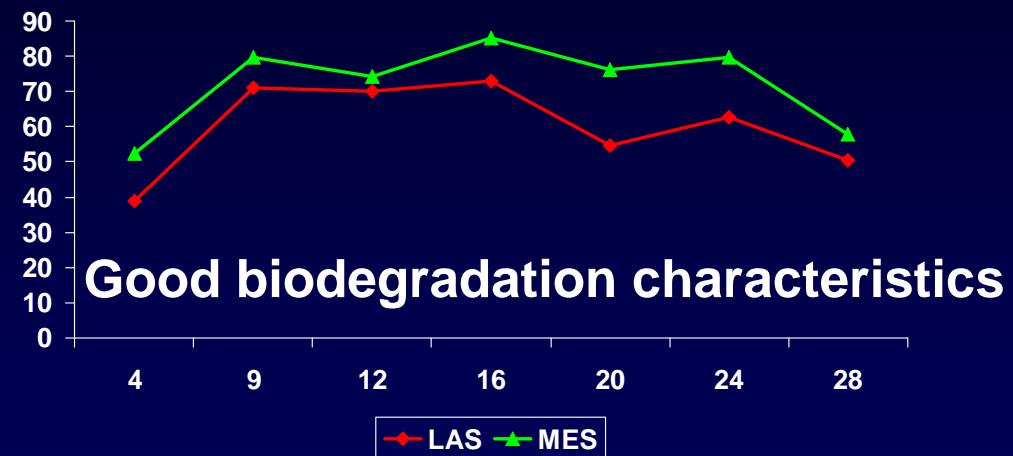


## % Utilization of Palm Products in Malaysian Oleochemical Industry

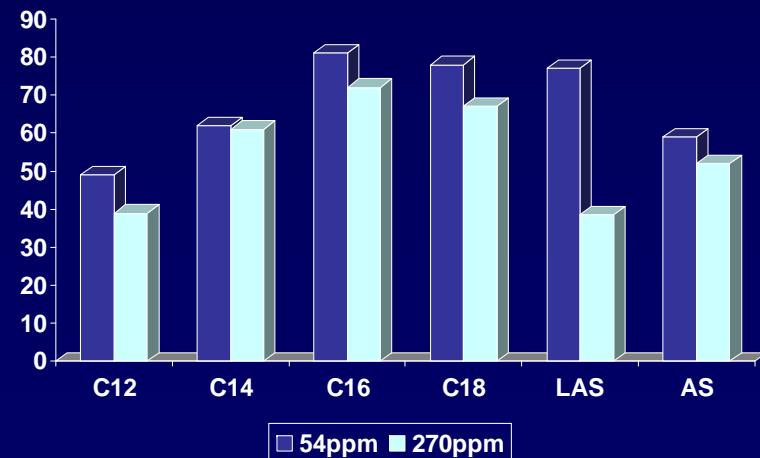


# SOME ADVANTAGES OF PLANT DERIVED PRODUCTS

- Plant derived products – linear structure – easily biodegradable
- Acceptable to all religions
- Good cost performance ratio (less sensitive to water hardness)



**Performances very depending on chain lengths**



**More tolerance to water hardness**

# SUSTAINABILITY

Small population:  
Need to move to  
Capital intensive  
industry

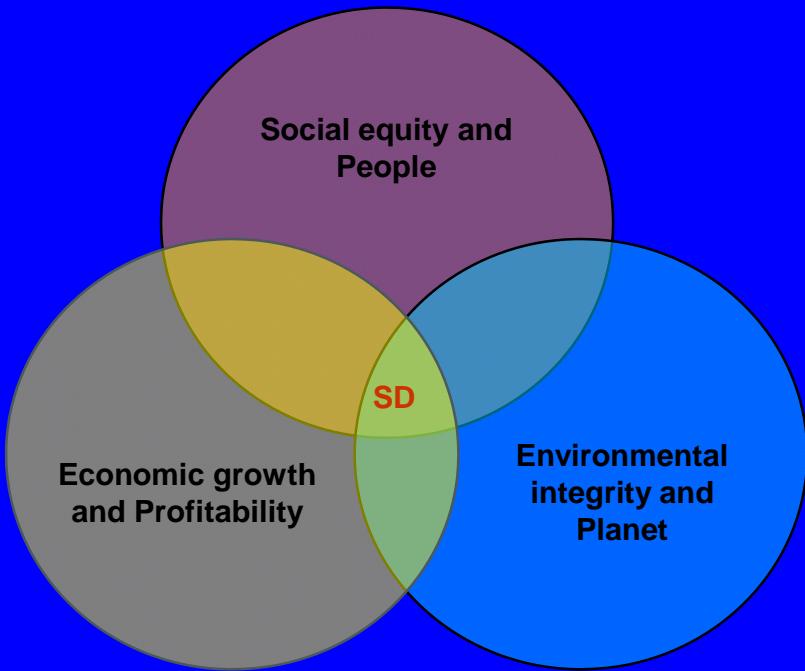
futur  
needs.

The Brundt

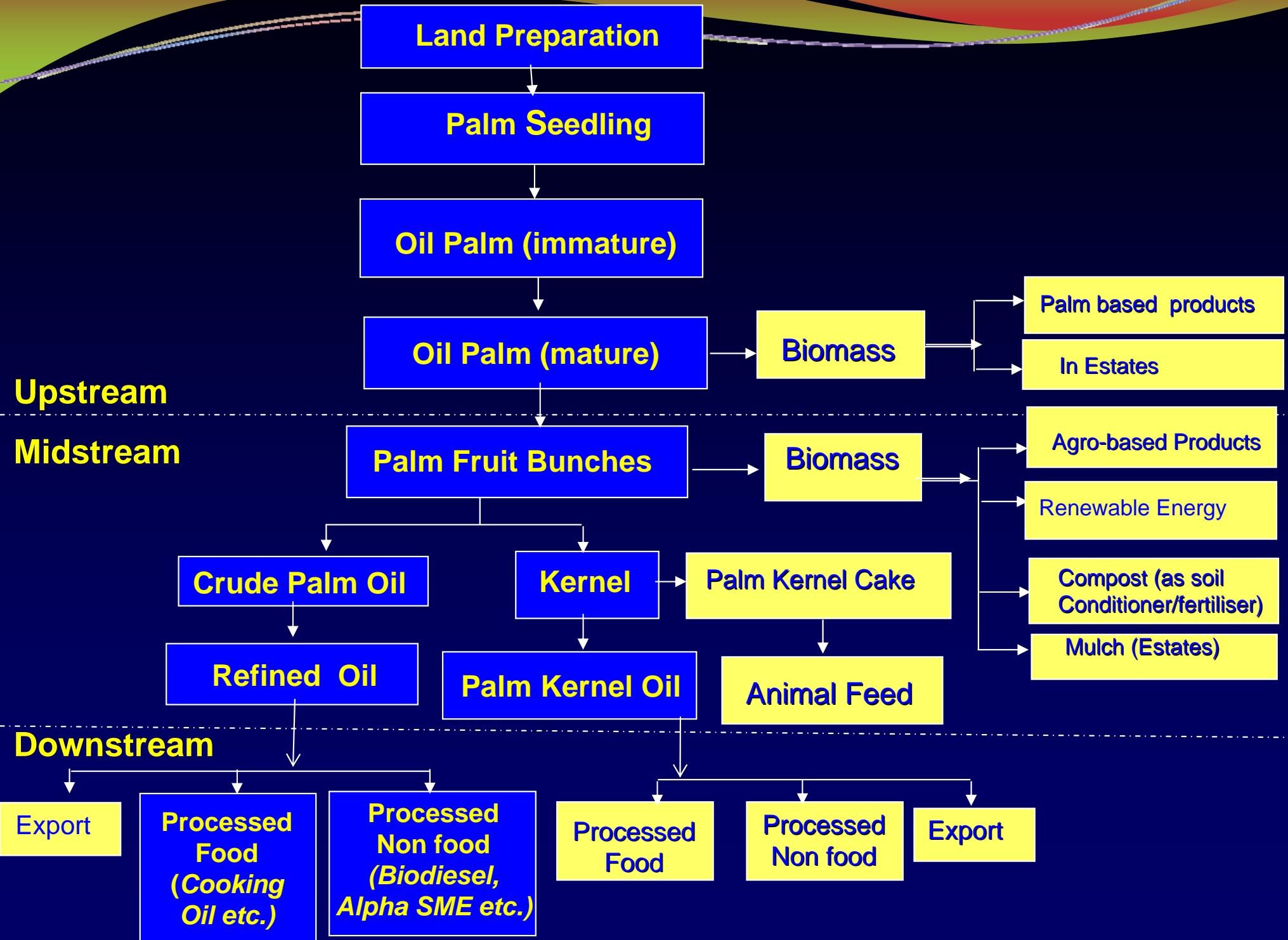
Industry with  
Better value  
addition

Without extreme  
Modifications  
Plant derived  
products are  
More Environment  
friendly

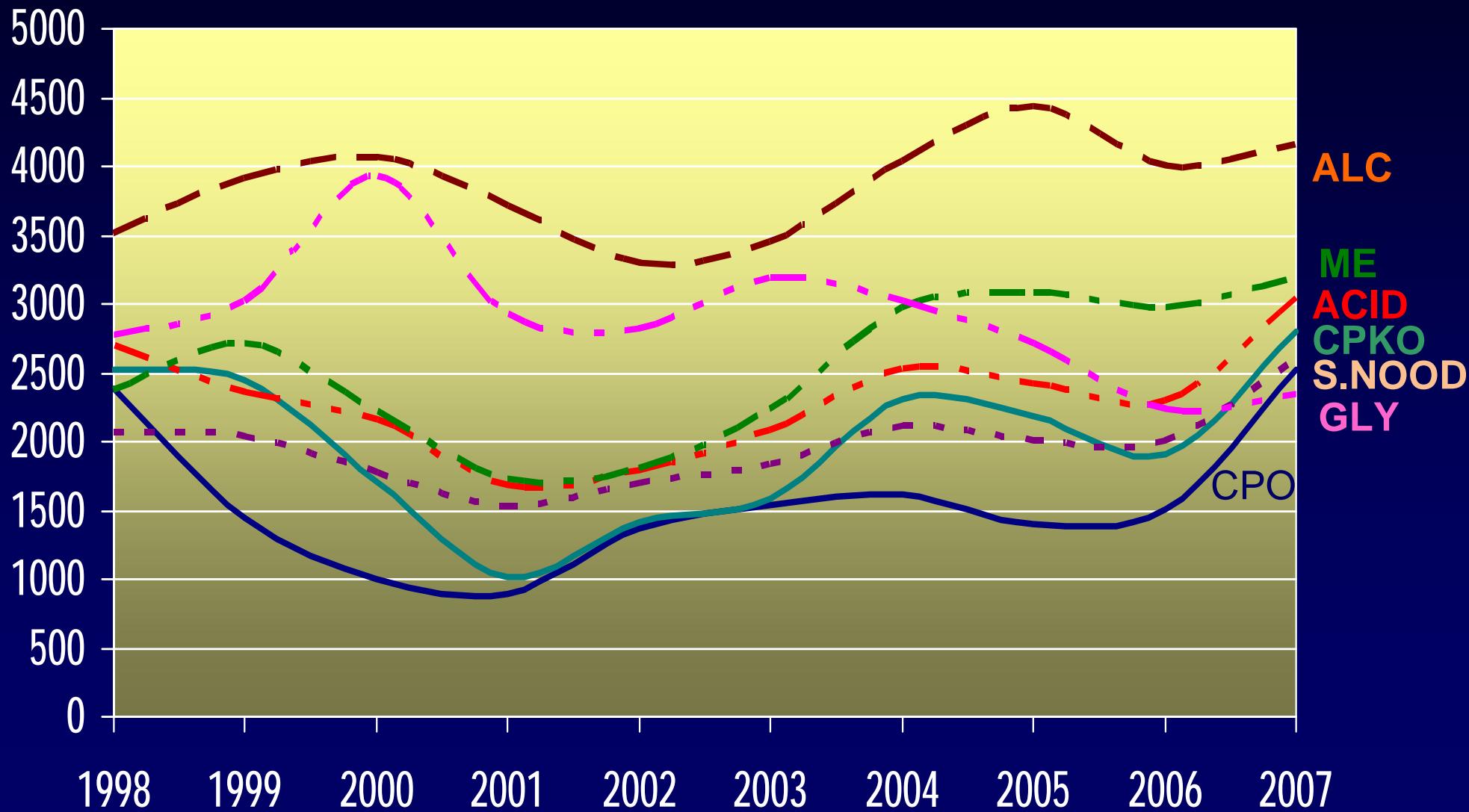
Sustainable Development (SD) with Equal  
Emphasis on the 3Ps



# LCA OF PALM PRODUCTS PRODUCTION



# PRICES OF OLEOCHEMICALS (RM/tonne)

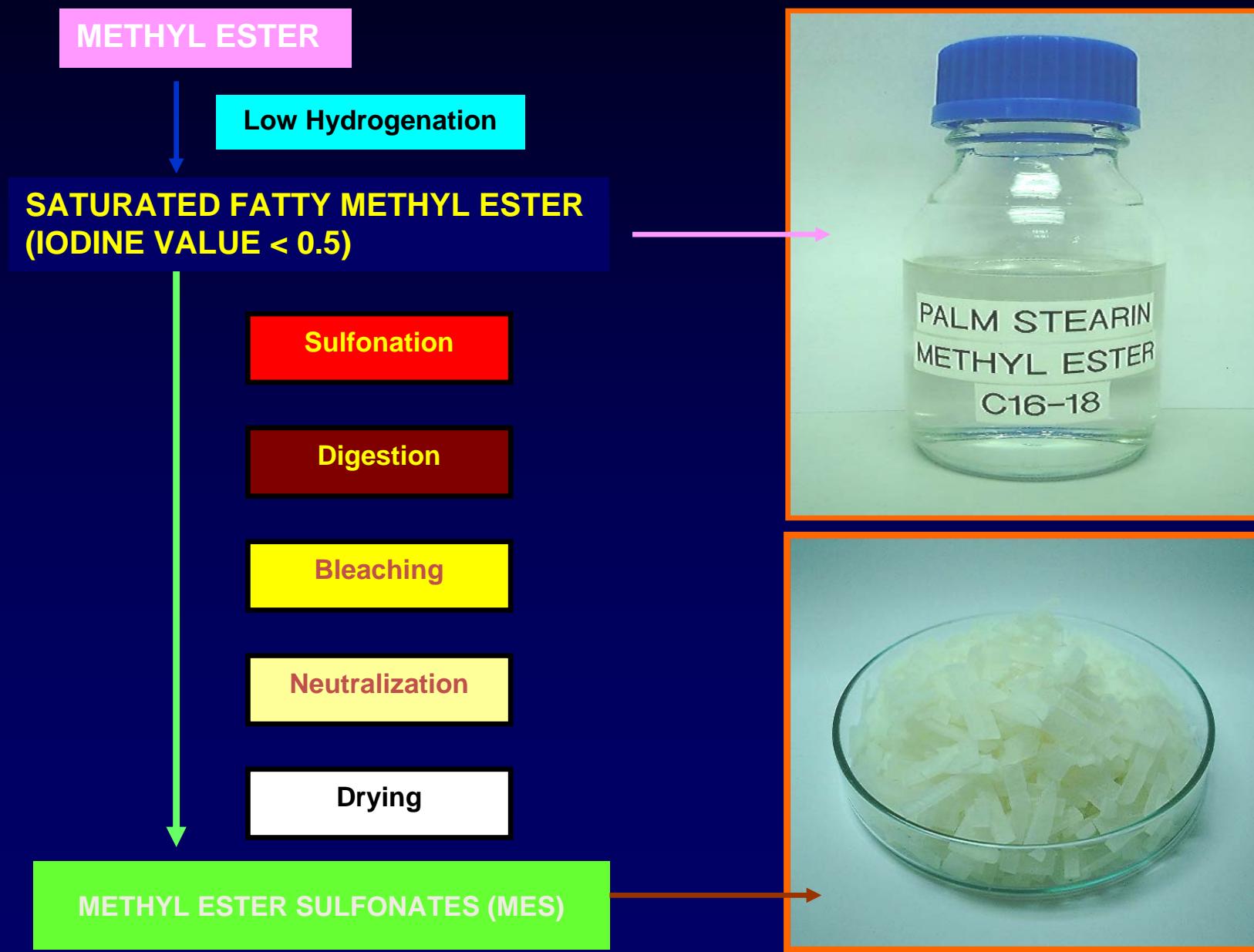


# **DIVERSIFY USES FOR BETTER PROFITABILITY**

**R&D TO :**

- Find new uses for methyl ester
- Find uses for co-products
- Utilize waste

# METHYL ESTER: FEEDSTOCK FOR MES (ANIONIC SURFACTANTS)



# PERFORMANCES: MES VS OTHERS

DETERGENCY <sup>(*)</sup>	→ LABS	~	MES	~	FAS	~	FAES	~	AOS	Similar detergency power
FOAMING <sup>(*)</sup>	→ LABS	~	AOS	~	FAES	~	FAS	~	MES	Similar foaming power
SOLUBILITY	→ LABS	>	FAES	>	AOS	>	MES	>	FAS	Acceptable solution
SKIN COMPATIBILITY	→ MES	>	AOS	>	FAES	>	LABS	>	FAS	Better skin compatibility
SENSITIVITY TO H <sub>2</sub> O-HARDNESS	→ FAS	>	FAES	>	LABS	>	AOS	>	MES	Lower sensitivity to water hardness

<sup>(\*)</sup> Very similar, using optimum chain length selection

Source: Ballestra

# APPLICATION OF MES

- ✿ Powder detergent
- ✿ Liquid detergent
- ✿ Liquid dishwash

- ✿ Gel dishwash
- ✿ Handwash
- ✿ Paste dishwash

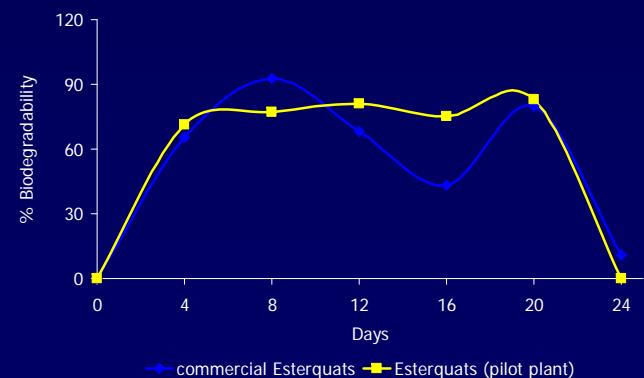


# METHYL ESTER: FEEDSTOCK FOR ESTERQUATS

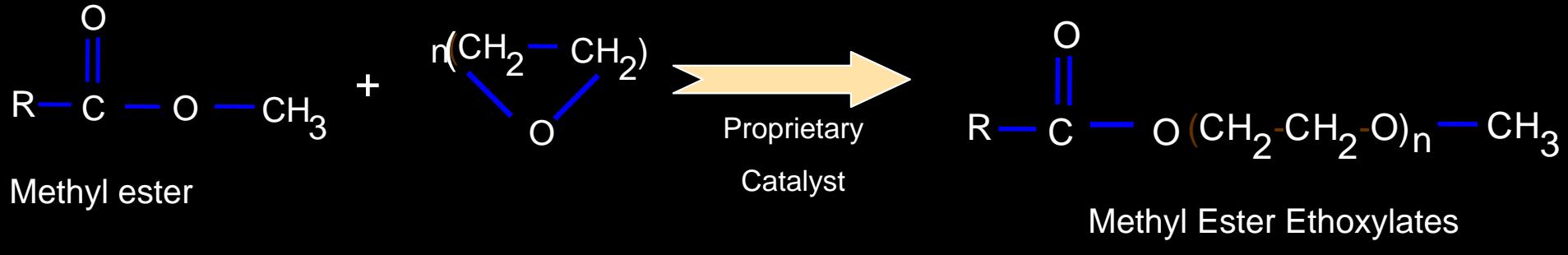
- Conventional quaternary ammonium compounds - an excellent softening performance.

- Unfavourable biodegradation characteristics and can not meet stringent environmental regulations

**ESTERQUATS**  
surfactant of choice due to its excellent environmental profile



# METHYL ESTER: FEEDSTOCK FOR MEE (NONIONIC SURFACTANTS)



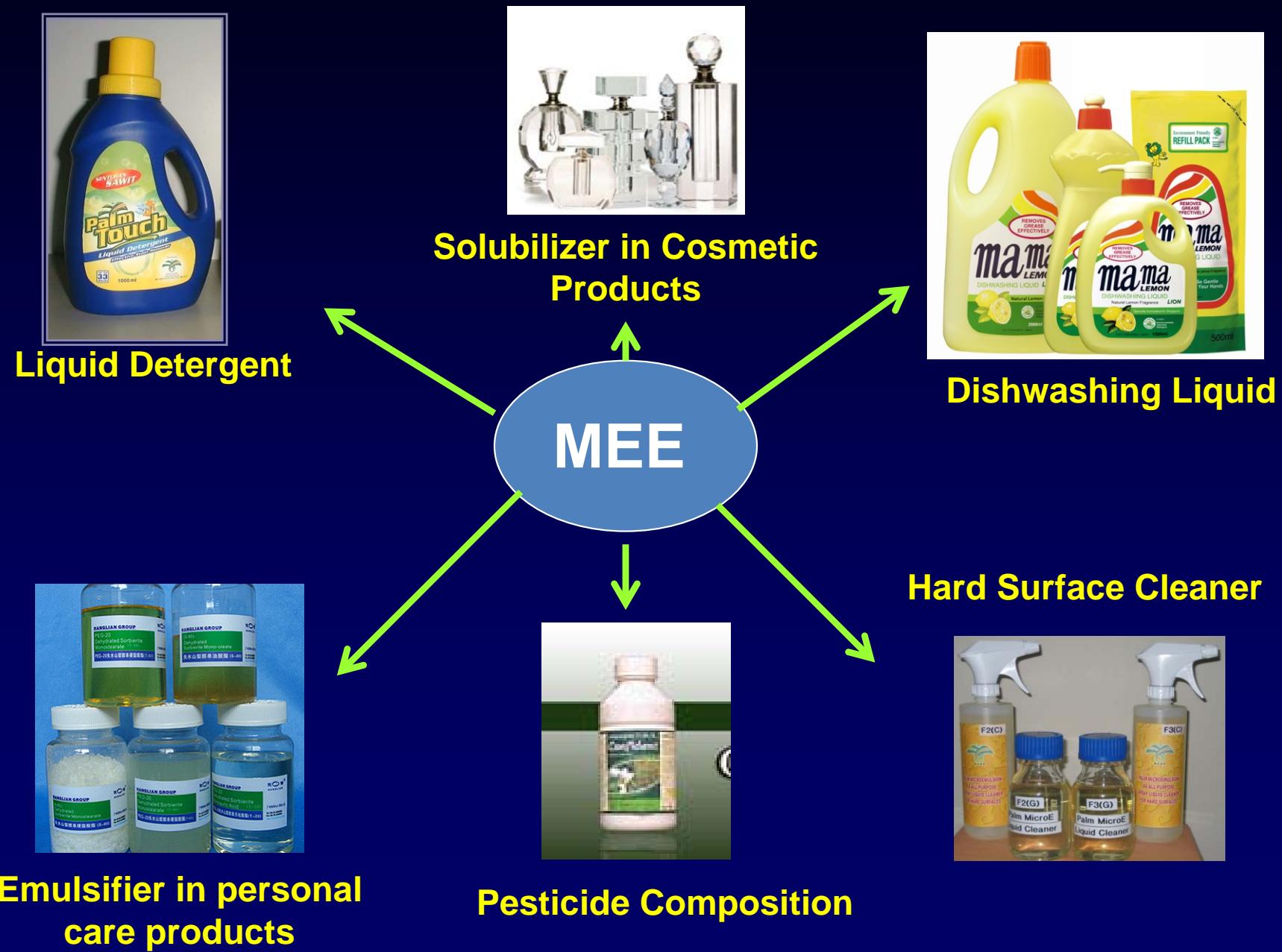
## Advantages:

- Faster dissolution in water
- Biodegradability
- Exhibit low aquatic toxicity
- Cheaper

## Applications:

- Emulsifiers,
- dispersants,
- wetting agents and solvents for adjuvant concentrates,
- pesticide compositions

# POSSIBLE APPLICATIONS OF METHYL ESTER ETHOXYLATES



## **IMPORTANT TO DIVERSIFY USES**

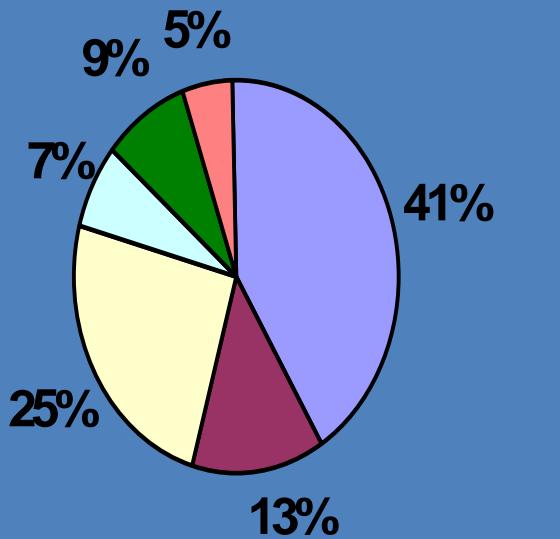
- Find new uses for methyl ester
- Find uses for co-products

## **GLYCEROL**

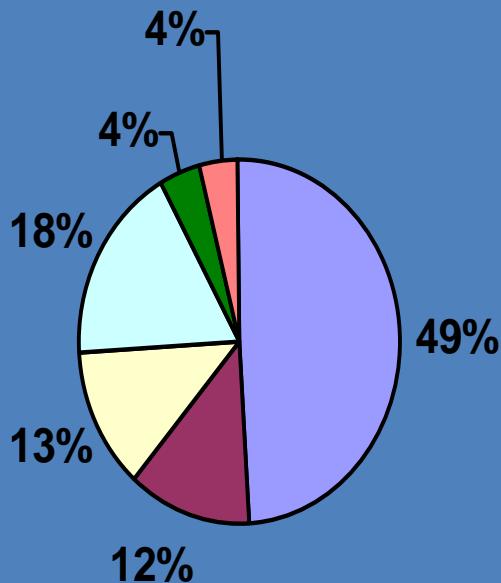
- Utilize waste

# SOURCE OF GLYCEROL

1999

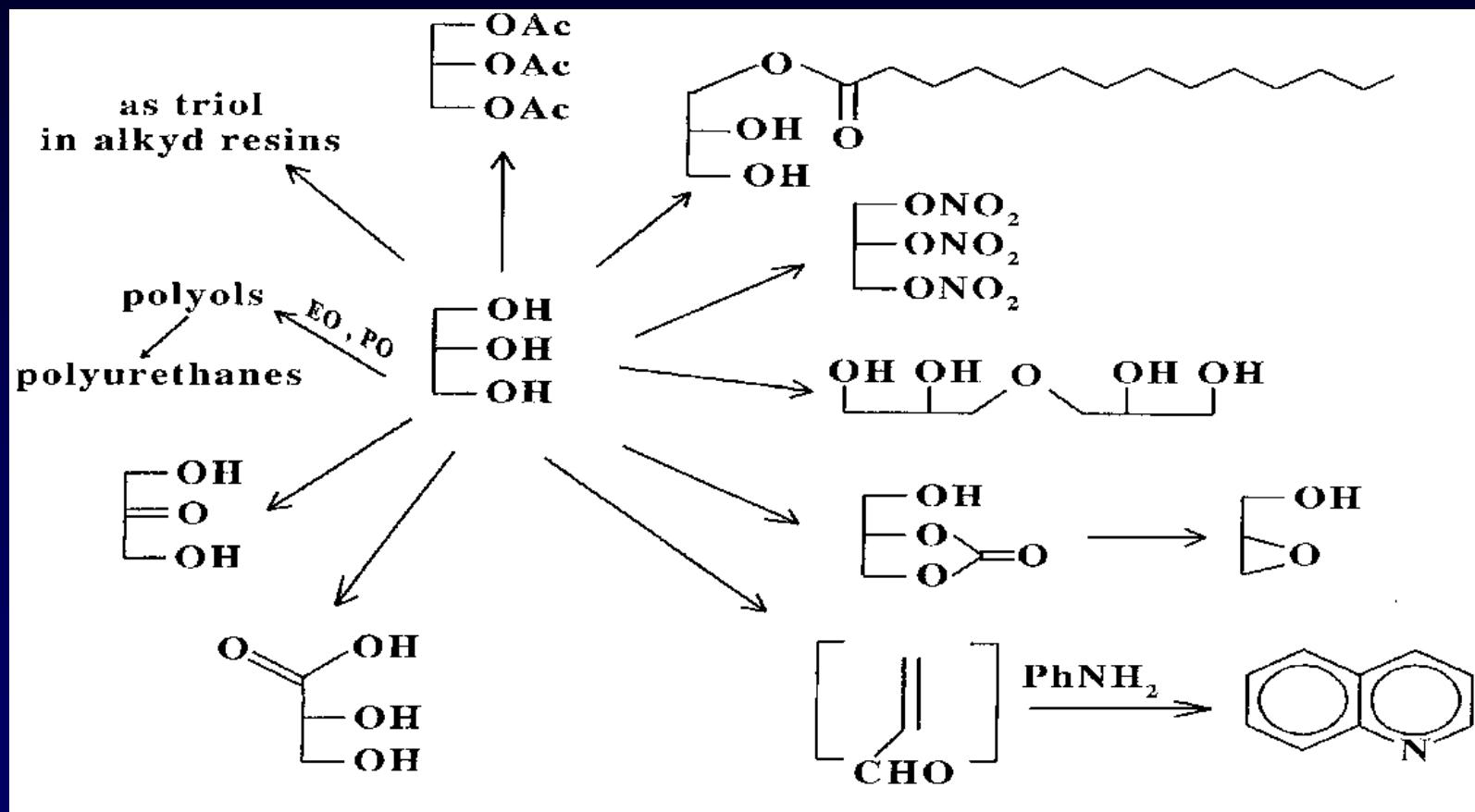


2004

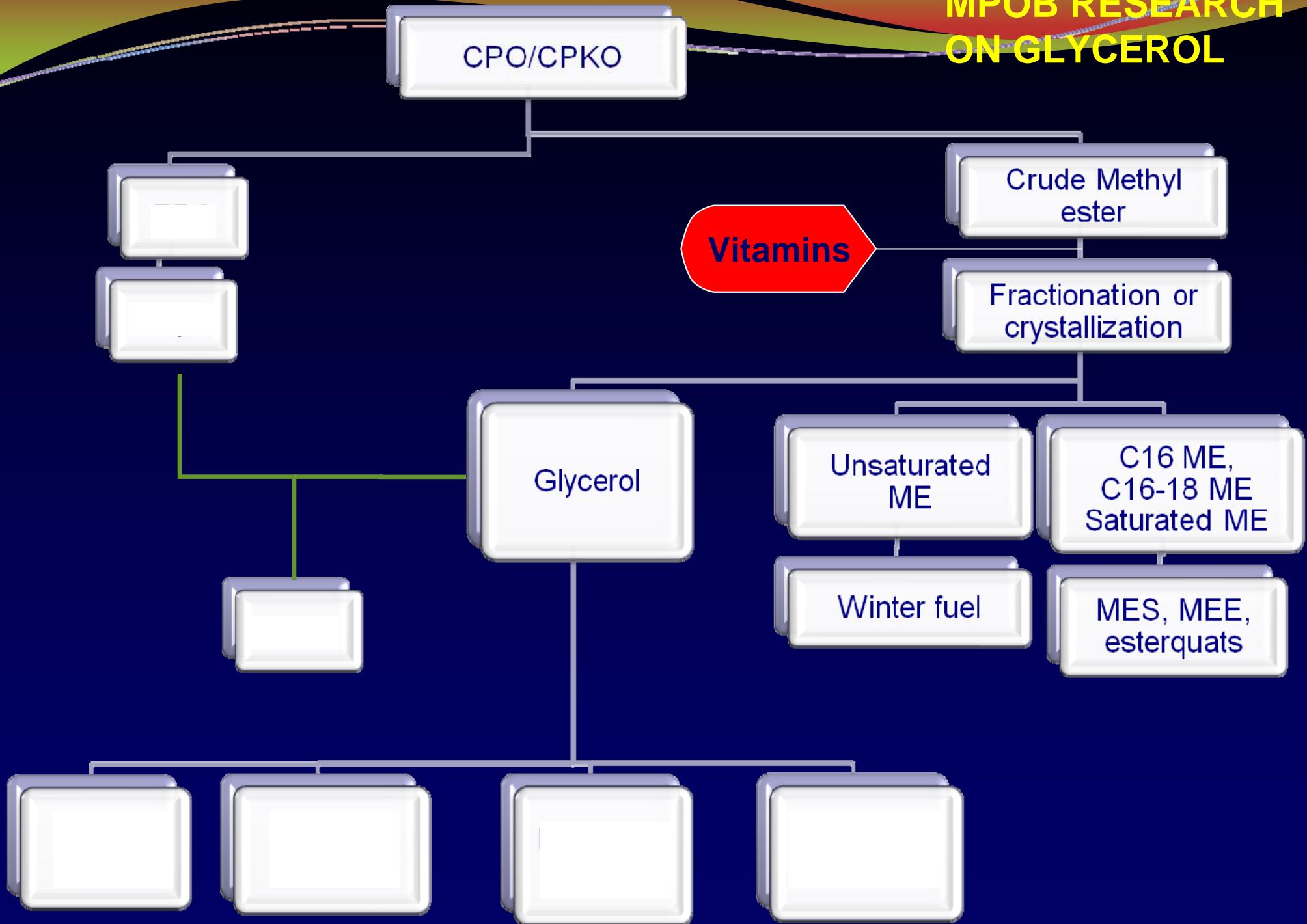


Source : Frost & Sullivan

# POSSIBLE PRODUCTS FROM GLYCEROL

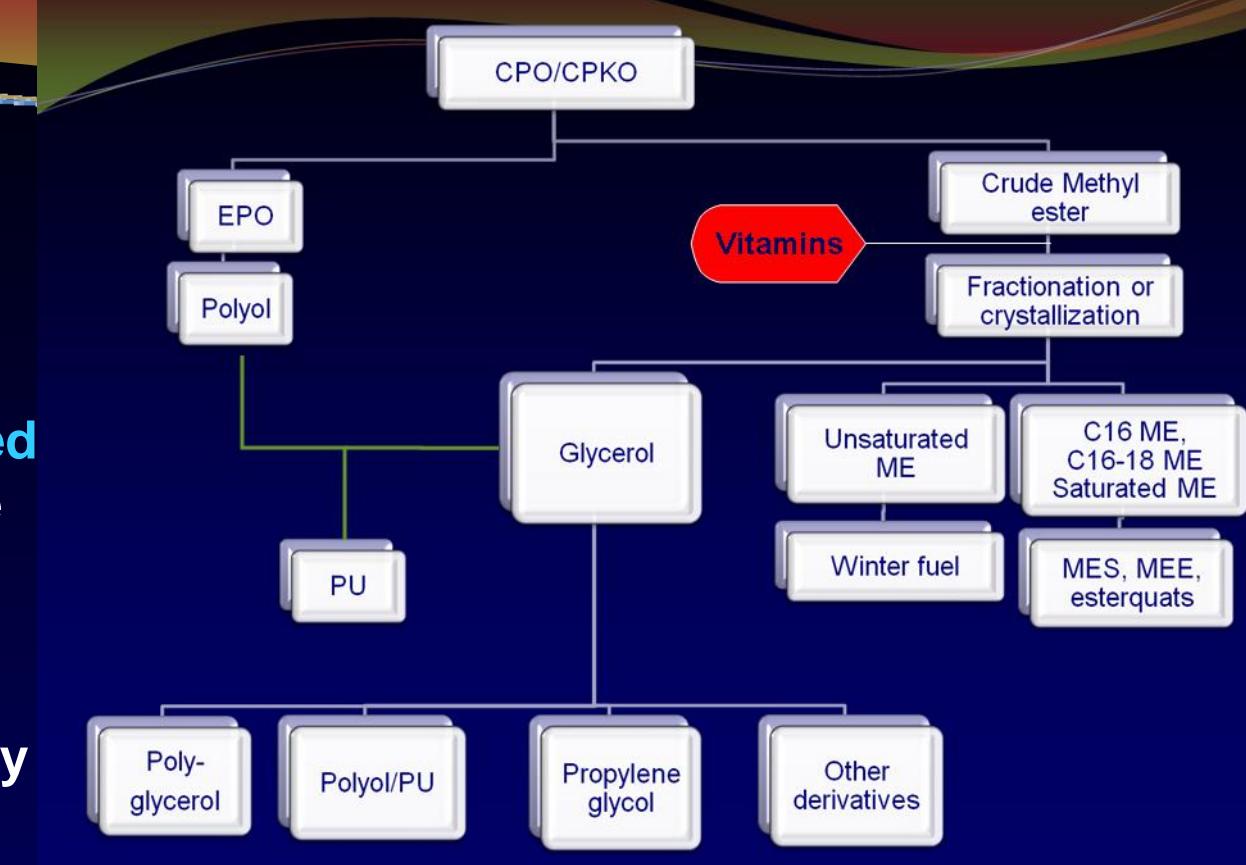


# MPOB RESEARCH ON GLYCEROL

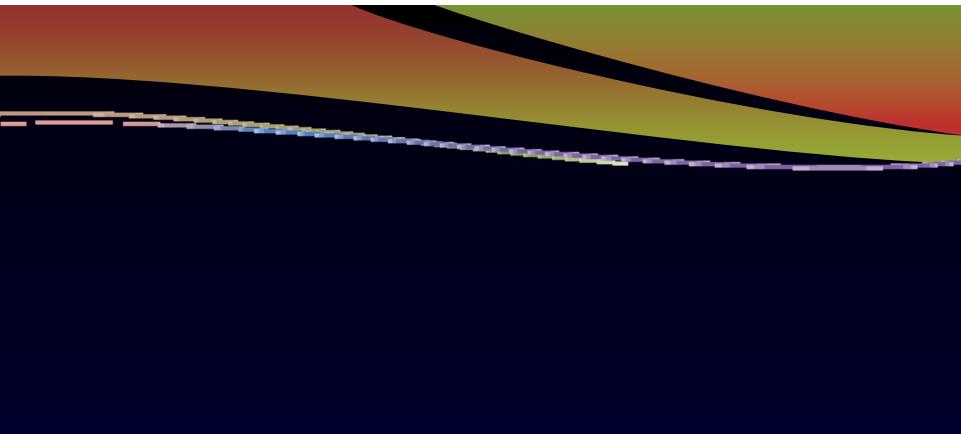


# CONCLUSIONS

- Biodiesel/oleochemicals welcome additions to the OP supply chain.
- Methyl ester - feedstock required
- Palm Methyl Ester - sustainable & environmentally friendly:-
  - renewable source,
  - high productivity,
  - adequate/predictable supply
  - plant-derived - easily biodegradable/acceptable to all religion
- The development enhance sustainability - reduce Malaysia's dependence on foreign labours and improve value adding.
- Preferably complementing existing industries



\*\* To further enhance the sustainability it is further proposed the uses of methyl ester be diversified and value be added to the by-products. A possible strategy is to develop biorefinery complex



**THANK YOU FOR YOUR KIND ATTENTION**

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