

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

Wolfgang Rupilius (Consultant)
Salmiah Ahmad (MPOB)

WHAT IS BIODIESEL ?

- | | |
|-----------------------|------------------------------------|
| ■ FAME | ☞ FATTY ACID METHYL ESTER |
| ■ VOME | ☞ VEGETABLE OIL METHYL ESTER |
| ■ ENVODIESEL | ☞ PALM OLEIN +PETROLEUM DIESEL |
| ■ SUN DIESEL | ☞ DIESEL FROM BIOMASS |
| ■ RENEWABLE
DIESEL | ☞ HYDROCARBONS FROM OILS/FATS |
| ■ NExBTL | ☞ HYDROCARBONS FROM OILS/FATS |
| ■ TESSOL | ☞ FAME ,TRIGLYCERIDES & BIOETHANOL |

ETC , ETC

IN THIS PRESENTATION :

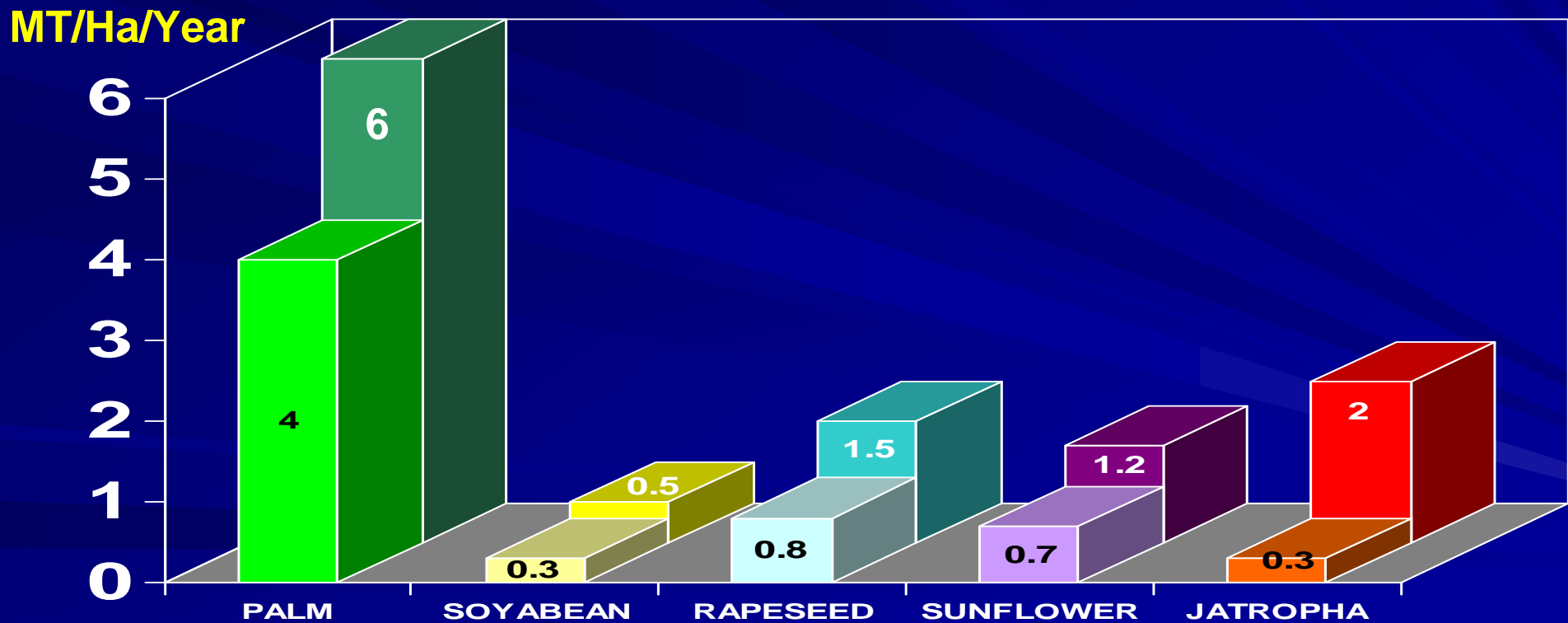
BIODIESEL IS ANY FUEL SUITED
FOR DIESEL ENGINES BASED
ON RENEWABLE RAW
MATERIALS

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

VEGETABLE OILS/RAW MATERIALS FOR BIODIESEL	PRODUCTION IN MILLION MT (2007)
PALM	38
SOYA BEAN	36
RAPE SEED	16
SUN FLOWER SEED	10
JATROPHA	> 1
TOTAL	100

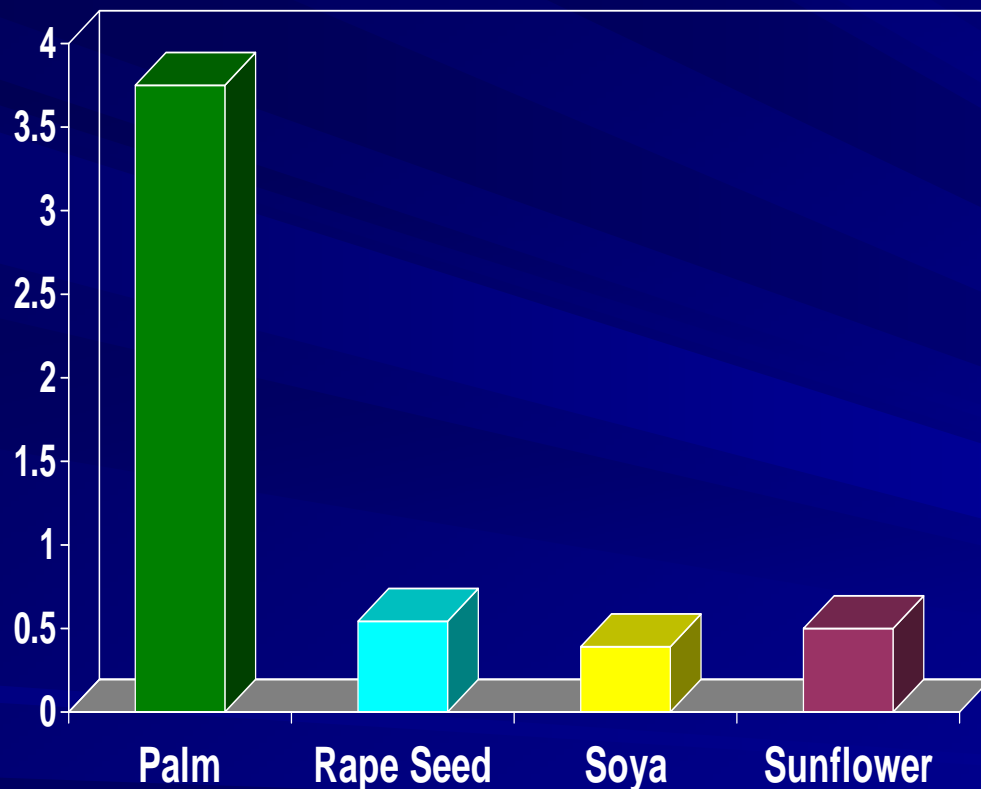
BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

PRODUCTIVITY OF BIODIESEL RAW MATERIALS



GLOBAL BIODIESEL YIELDS

Kilo liters/Ha/Yr



OIL	BIODIESEL	LAND
PALM	3750 liters	1.0 Ha
RAPESEED	3750 liters	6.8 Ha
SOYA	3750 liters	9.4 Ha
SUNFLOWER	3750 liters	7.5 Ha

Source: Environmental Research Letters 4(2009) – “Resetting Global Expectations from Agricultural Biofuels”. Based on 22,000 sets of data from 238 countries.

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

JATROPHA OIL :
A SOLUTION TO THE ISSUE OF “FOOD OR FUEL” ?

“.....At this stage it is still particularly important to distinguish between **reality** , **promises** and **dangerous extrapolations**. To avoid, spectacular and regretful failures and waste of money for investors as well as great disappointments for local populations, promoters of large scale plantation are invited to adopt stepwise approaches

Summary from:

POSITION PAPER ON JATROPHA AND LARGE SCALE DEVELOPMENT, FACT (FUEL FROM AGRICULTURE IN COMMUNAL TECHNOLOGY) , WAGENINGEN , NETHERLANDS , JUNE 2007 .

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

PROPERTIES OF FAME BIODIESEL

METHYL ESTER	CETANE NR.	CFPP Cold filter plugging point	IV Iodine value
PALM	60	+13	45
SOYA	53	-3	125
RAPE	55	-12	110
JATROPHA	52	-2	100

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

CLOUD POINT OF PALM OIL METHYLESTER- PETRO-DIESELMIXTURES

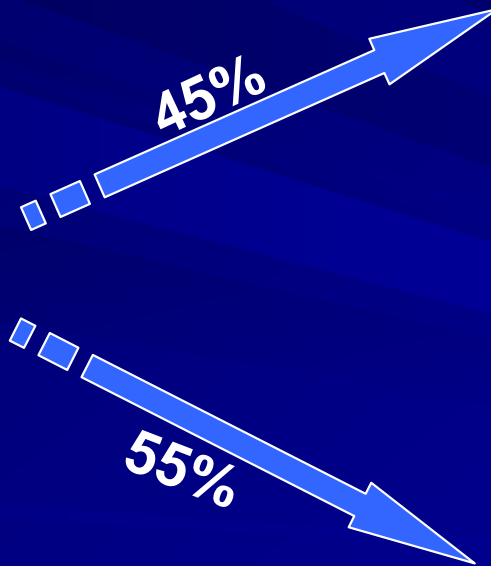
MIXTURES	CLOUD POINT (°C)
B-100	+15
B-30	+2
B-20	0
B-10	-2
B-0	-2

Lit.: Monica Cuellar Sanchez , Posibilidades del biodiesel de palma , PALMAS Vol. 28 No. Especial , Tomo 2 2007

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

FRACTIONATION OF PALM OIL METHYLESTER THROUGH DISTILLATION

C 14:0	2 %
C 16:0	42 %
C16:1	0,5 %
.....	
C18:0	5 %
C18:1	41 %
C18:2	10 %



C14 3%
C16:0 96% (MP 28°C)
C16:1 1%
* Raw material for surfactants
* Warm Climate Biodiesel

C18:0 7%
C18:1 74%
C18:2 19%
* Winter biodiesel

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

COMPOSITION OF DIFFERENT FAME-BIODIESEL QUALITIES

METHYL ESTER	C14	C16	C18:0	C18:1	C18:2	C18:3
PALM	2	43	5	41	10	-
F- PALM*	-	-	7	74	19	-
RAPE	-	4	5	55	28	8
SOYA	-	8	5	28	53	6

* Frantionated Palm

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

HYDROCARBONS FROM FATS AND OILS AS BIODIESEL



n-HEXADECANE = CETANE = CETANE NUMBER 100

NESTE OIL , ÖMV

PETROBRAS

CONNOCO- PHILLIPS

NExBTL

H-BIO

RENEWABLE DIESEL

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

HYDROCARBONS FROM DIFFERENT FATS AND OILS

TRIGLYCERIDE	HEXADECANE (%)	OCTADECANE (%)
PALM STEARINE	50	50
PALM OIL	45	55
TALLOW	35	65
SOYA	8	92
RAPE SEED	5	95

MELTING POINT : n-HEXADECANE = 18°C, n-OCTADECANE = 28°C
During the manufacturing process isomerization to lower melting branched hydrocarbon is taking place

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

TIPICAL PROPERTIES OF HYDROCARBONS FROM FATS AND OILS

CETANE NUMBER	👉	FROM 84 TO 99
CLOUD POINT	👉	DOWN TO -30°C
SATURATED	👉	NO RISK OF GUM FORMATION
COMPATIBILITY	👉	COMPLETELY COMPATIBLE WITH PETROLEUM DIESEL

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

ORGANIC MATERIAL



CARBON MONOXIDE + HYDROGEN



Fischer-Tropsch Synthesis

LIQUID HYDROCARBONS

For one tonne of biodiesel around 5 tonne of organic material are needed

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

BIODIESEL	INVESTMENT FOR 200,000 TONNE (MILLION EURO)	RAW MATERIAL REQUIRED FOR 200.000 MT (TONNE)
FAME	40	225,000
NExBTL	150	240,000
BTL	800	1,000,000

**Lit.: OMV Refining & Marketing , alternative Treibstoffe im ÖPNV , Stuttgart
30.01.2008**

BIODIESEL FROM PALM OIL IN COMPARISON WITH OTHER RENEWABLE FUELS

SUMMARY

- ▣ Palm oil - the lowest cost vegetable oil for biodiesel
- ▣ Palm oil - needs far less agricultural land for production
- ▣ **Palm oil based FAME Biodiesel not suited low temperatures**
- ▣ **Palm oil based FAME- Biodiesel modified through distillation suited for low temperatures**
- ▣ Jatropha oil based biodiesel is probably not a solution for “FUEL OR FOOD” problem
- ▣ Palm oil/stearin based hydrocarbon biodiesel has excellent overall properties
- ▣ The BTL-Biodiesel investment cost is extremely high, a broad introduction in the near future is unlikely
- ▣ Whatever the raw material for the future generation of biodiesel will be, always the tropical countries will have a cost advantage

THANK YOU

rupilius@aol.com
salmiah@mpob.gov.my