

BIODIESEL FEEDSTOCKS ARE CHANGING – AFFECTING THE VALUE OF THE BY-PRODUCTS

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Biodiesel production before 2003 can be regarded as unregulated with a variety of starting materials and production techniques. Methyl and ethyl esters were prepared and used as diesel fuel replacements. During 2003 the vehicle industry accepted formal standards and Europe adopted the EN 14214 the USA the ASTM D 6751 composition and quality parameters. A study of the global biodiesel industry indicates that the present 1st-generation feedstocks will make way for different 2nd-generation starting materials. The result will be different by-products.

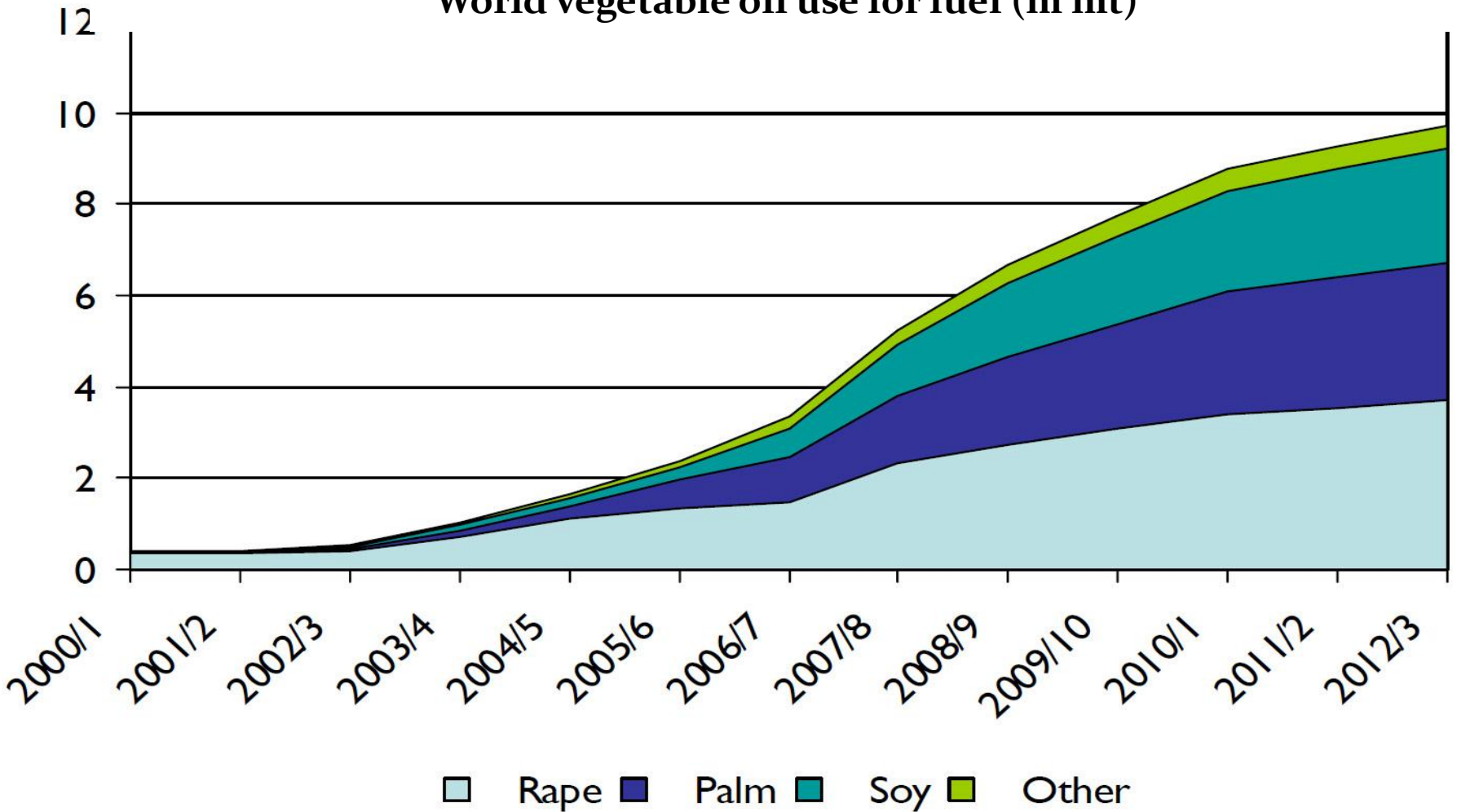
- Feedstock materials before 2003: Four vegetable oils, namely soybean, oil palm, rapeseed/canola and sunflower were regarded as leaders based on their production potential. It is important to note that all four oils were already established in the food sector. Animal fats and used frying oils were also evaluated as starting materials, however their volumes were low.
- Feedstock oils for commercial use from 2003: Three oils, namely rapeseed/canola, soya and oil palm made a significant impact in the biodiesel industry. Rapeseed was the choice in Europe (availability, price and composition), soybean in the USA (major oil seed) and oil palm in South Asia (very high oil yield). Soya and rapeseed oilcake are valuable protein sources for feed applications. Oil palm fruit yield large volumes of fiber as well as kernel protein.
 - Indications that the “food versus fuel” debate is valid: In the United Soybean Board’s document dated November 2005, the following statement was made: “The pressure on global oilseed supplies became visible and signs that the oilseed demand for energy affects food supplies”.
 - At a biodiesel industry poll held in 2006, it was stated that only 2% of the diesel fuel market can be supplied by biodiesel with present production. With increased production practices the ratio can be improved to 10%.
 - At a World Bio-fuels Market Meeting held in 2007 the statement was: “There is not enough European-based feedstock to keep up with biodiesel production. Other diesel type fuels, produced by gasification, will be needed”.
 - Thomas Mielke observed: (1) “Government targets for biodiesel use are too ambitious; (2) Serious effects will arise in the food sector; (3) Palm oil will be better suited for the increased biodiesel demand“.
 - Data on the growth of the biodiesel industry from 2001 to 2011, showed a yearly growth of 40%.

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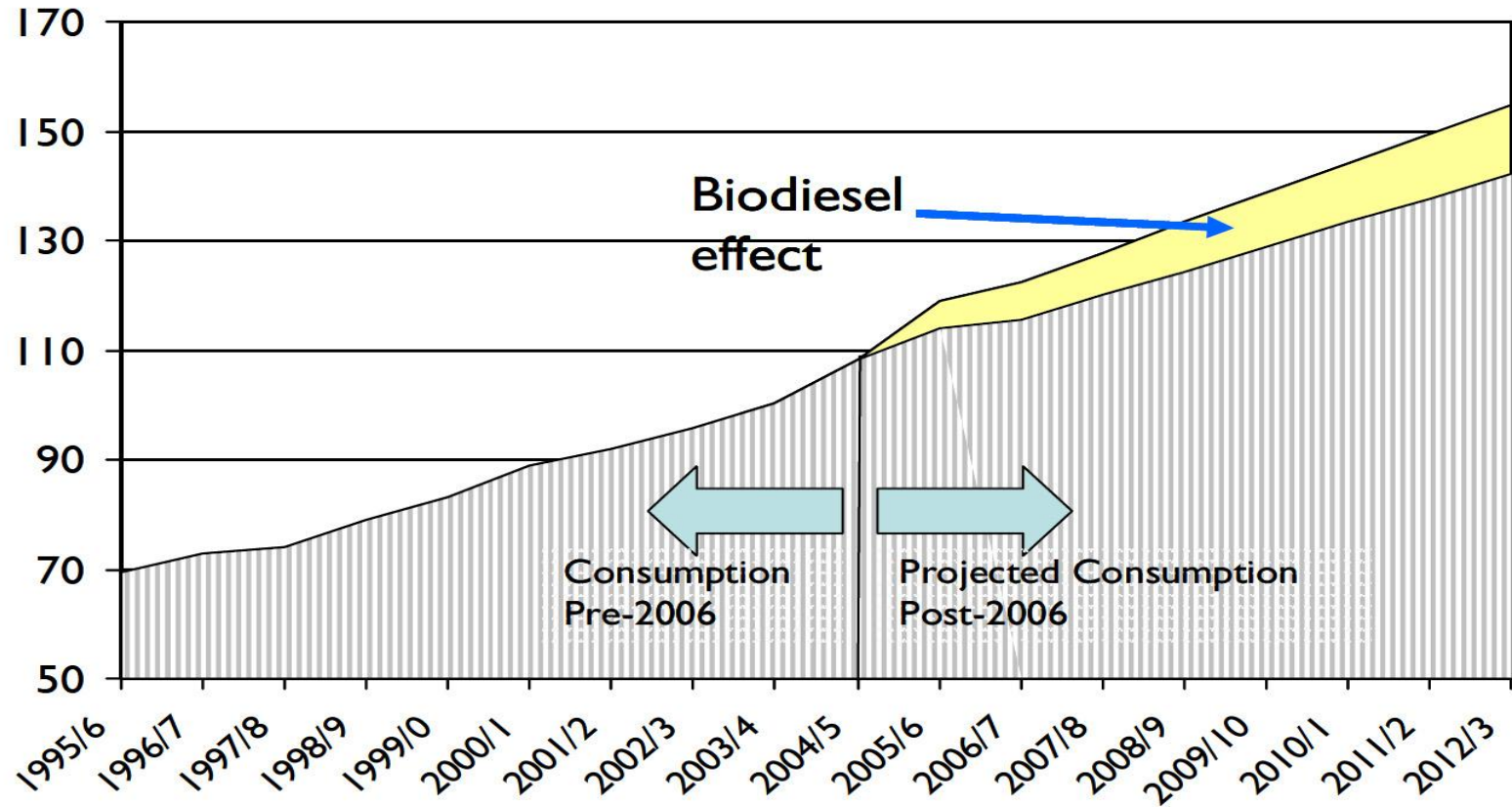
• INTRODUCTION:	PHASE	BEFORE 2003 DURING 2004 – 2012 FROM 2013 – 2020
• AVAILABILITY OF FEEDSTOCKS:		2004 - 2012
• ALTERNATIVE FEEDSTOCKS/TECHNOLOGY:		SEVEN EXAMPLES
• BY-PRODUCT VARIATION AND VALUE		

World vegetable oil use for fuel (m mt)

World vegetable oil use for fuel (m mt)



World vegetable oil consumption to 2012/13, (m mt)



World vegetable oil consumption to 2012/3 (million metric tons), USB Promar Report, Nov 2005

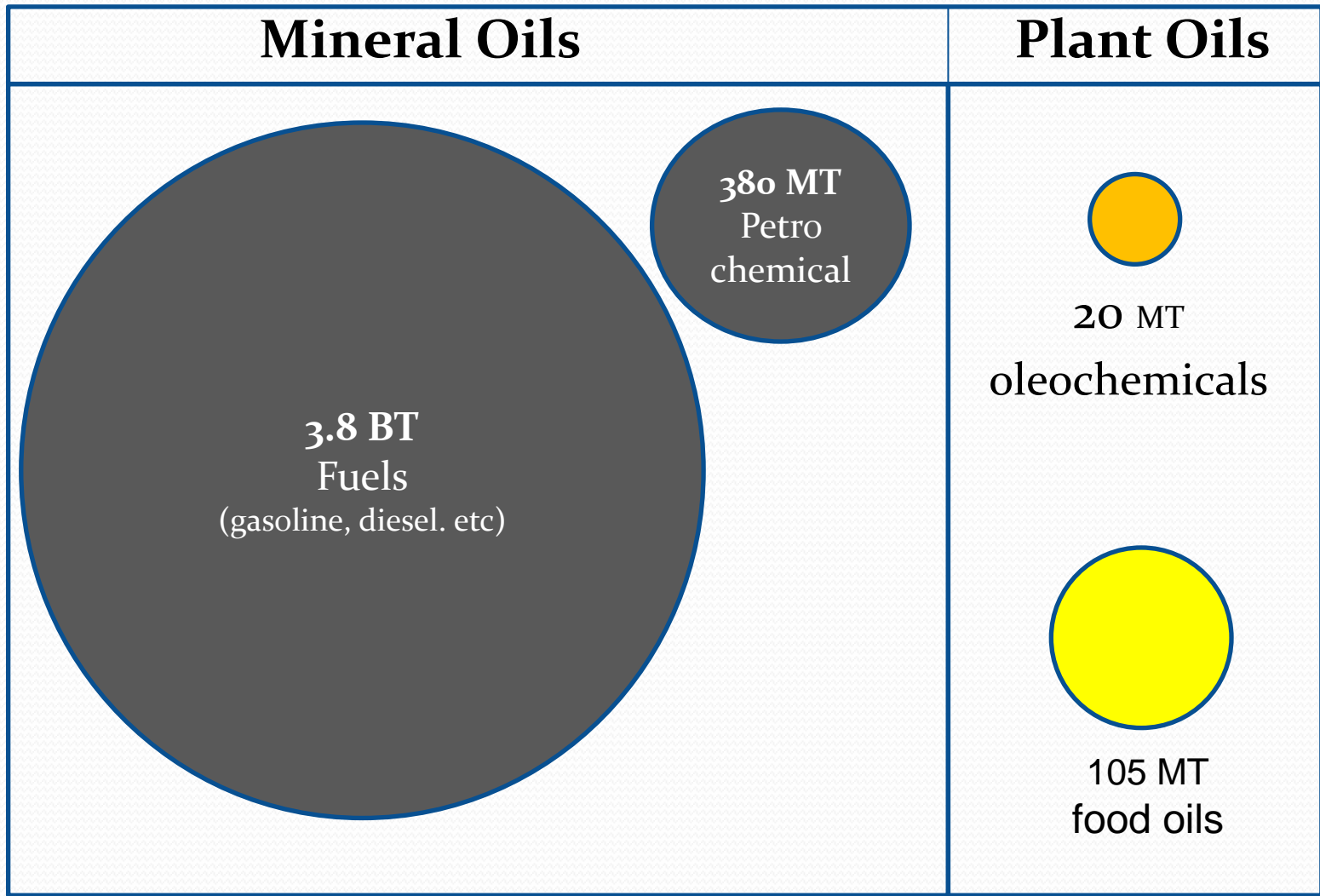
“One of the main issues in Europe is that of feedstock availability. There is not enough European-produced feedstock to keep up with European biodiesel production”

Biorenewable Resources No 2, Inform
August 2006

Same concern expressed
Biofuels Market Meeting, 2007

BIODIESEL FEEDSTOCKS OVER 3 YEARS (Million Tons)

FEEDSTOCK	2009	2010	2011
SOYBEAN	4,6	5,5	7,36
RAPESEED	5,8	6,3	6,05
PALM	3,6	4,6	4,95
USED OIL	1,0	1,0	1,37
ANIMAL FATS	0,92	0,93	1,32
TOTAL	15,92	18,33	21,05
			Oilworld, June 2012



Relative scale of global mineral oil and plant oil production and utilization. Oil World Annual 2008; printed Inform June 2009

EXAMPLE OF NON-FOOD PLANT-CAMELINE SATIVA

PLANT	FEEDSTOCK	FUEL COMPOSITION	BY-PRODUCTS
CAMELINA	SEED OIL	METHYL ESTERS (Traditional Biodiesel) Or Hydrocarbons (Renewable Diesel)	PROTEIN OILCAKE

Inform Nov/Dec 2011

EXAMPLE OF NON-EDIBLE PLANT – JATROPHA CURCASS

PLANT	FEEDSTOCK	FUEL COMPOSITION	BY-PRODUCTS
JATROPHA	SEED OIL	METHYL ESTERS	TOXIC WASTE

Mittelbach & Remschmidt, 2006

EXAMPLE OF NON-FOOD FEEDSTOCK - ALGAE

ALGAE	FEEDSTOCK	FUEL COMPOSITION	BY-PRODUCTS
	ISOLATED OIL	METHYL ESTERS	BIOMASS
	BIOMASS	HYDROCARBONS BY CRACKING	WASTE
			Oilgae Report, 2008

EXAMPLE OF 2ND GENERATION RENEWABLE DIESEL

PLANT	FEEDSTOCK	FUEL COMPOSITION	BY-PRODUCTS
PINE TREE	WOOD/LEAVES	TURPENTINE FUEL	BIOMASS
			Inform, April 2012

EXAMPLE OF RENEWABLE DIESEL BY KNOWN TECHNOLOGY (SASOL)

FEEDSTOCK	FUEL COMPOSITION	BY PRODUCT
MANY FEEDSTOCK SOURCES	COMPLEX HYDROCARBON MIXTURE	AMMONIA CHEMICALS TARR ECT.
COAL		
CELLULOSIC PLANT MATERIAL		
BIOMASS		

EXAMPLE OF 2ND GENERATION TECHNOLOGY TO PROCESS TRIGLYCERIDE OILS BY HYDROTREATING

PLANT	FEEDSTOCK	COMPOSITION OF FUEL	BY-PRODUCT
SEVERAL SOURCES SUCH AS ANIMAL FATS, IMPURE LIPIDS	TRIGLYCERIDE OIL	COMPOSITION OF FUEL, HYDROBONS, STRAIGHT AND BRANCHED CHAIN	WASTE ASH MINERALS
		JET FUEL	
		KEROSENE	

EXAMPLE OF RENEWABLE DIESEL (2ND-GENERATION) FROM PLANT OIL OR ANIMAL FATS (NON-CATALYTIC CRACKING)

PLANT	FEEDSTOCK	FUEL COMPOSITION	BY-PRODUCT
CAMELINA OR ANIMAL FAT	TRIGLYCERIDE OIL	COMPLEX MIXTURE FROM "SYNGAS" TO DIESEL KEROSENE	OILCAKE FOR FEED WASTE

BY PRODUCTS FROM DIFFERENT FEEDSTOCKS

FEEDSTOCK	PROCESSING TECHNOLOGY	BY-PRODUCT
CAMELINA	CONVENTIONAL PROCESS CRACKING	OILCAKE OILCAKE
JATROPHA	CONVENTIONAL PROCESS	TOXIC WASTE
ALGAE	CONVENTIONAL PROCESS SASOL TECHNOLOGY	BIOMASS AMMONIA & CHEMICALS
PINE TREE	DISTILLATION	BIOMASS
BIOMASS	SASOL PROCESS	AMMONIA & CHEMICALS
CRUDE OILS & FATS	HYDROTREATING	CHEMICALS & TARR

“SAD NEWS”



THANK YOU