LIMITED E.U. TARGETS FAIL TO SUPPORT FAST IMPLEMENTATION OF ENERGY CROPS FOR TRANSPORTATION BIOFUELS IN SOUTH EUROPE

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Invited Speaker

The 4F CROPS E.C. Project:
"Successful scenarios for the establishment of non-food crops in EU27"

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Table 1. Annual Fuel Ethanol Production by Country (2007–2009)[45]

Top 10 countries/regional blocks
(Millions of liquid m^3 per year)

World rank	Country/Region	2009	2008	2007
1	United States	40.69	34.06	24.60
2	Brazil	24.90	24.50	19.00
3	European Union*	3.93	2.78	2.16
4	China	2.05	1.90	1.84
5	Thailand	1.65	0.34	0.30
6	Canada	1.10	0.90	0.80
7	India	0.35	0.25	0.20
8	Columbia	0.31	0.30	0.28
9	Australia	0.21	0.10	0.10
10	Other	0.94		
	World Total	73.99	65.61	49.60

**E.U. produces mainly biodiesel (biodiesel+ethanol production the year 2009 =9 M.T)*

Table 2. Consumption of Biodiesel in the European Union (M.m^3)[46]

#	Maa	2005	2006	2007	2008
1	Germany	1.22	2.00	2.29	1.96
2	France	0.27	0.46	0.96	1.60
3	United Kingdon	0.02	0.10	0.21	0.55
4	Italy	0.13	0.12	0.11	0.41
5	Spain	0.02	0.04	0.20	0.41
6	Poland	0.01	0.03	0.02	0.27
27	European Union	1.77	3.22	4.66	6.24

Note: The year 2006 the world production of biodiesel was 5-6 M.tonnes [46]

Table 3. Comparison between U.S.A. and E. U.		
To day production	40.69 Mm^3	7.00 Mm^3
Targeting Consumption 2015 2022	 70.00 $M.m^3$ 136.80 $M.m^3$	 ? 16.00 $M.m^3$*
Feedstocks	Corn	Grains, Sugar beet for ethanol Rapeseed, Sunflower, Waste veg.oil Animal fats , for biodiesel
CO2 Savings	10-30%	45% for biodiesel

**** Biodiesel and Bioethanol***

Table 4. World bioethanol Production, Cost and Feedstocks.

	Typical feedstock for bioethanol production	Production Costs (€/m^3)	Bioethanol Production Million m^3		
			2007	2008	2009
Brazil	sugarcane	170	19.00	24.50	24.90
U.S.A	grain maize	377 (2008)*	24.90	34.06	40.69
		253 (2009)*			
		245 (2010)*			
E.U	cereals and sugar beet	450	2.16	2.78	3.93
China	grain maize, wheat	310	1.84	1.90	2.05
India	Sweet Sorghum	278-300	0.20	0.25	0.35
Mediterranean	Sweet-Sorghum *(Eubia estimations)*	200-250	-	-	-

Source : EUBIA (modified)

* *Με 0.67% η 1η ύλη και 0.82 % νερό . World Ethanol and Biofuels Report ,2010*

Fig. 1. World – Ethanol Export Prices ($ per m^3)

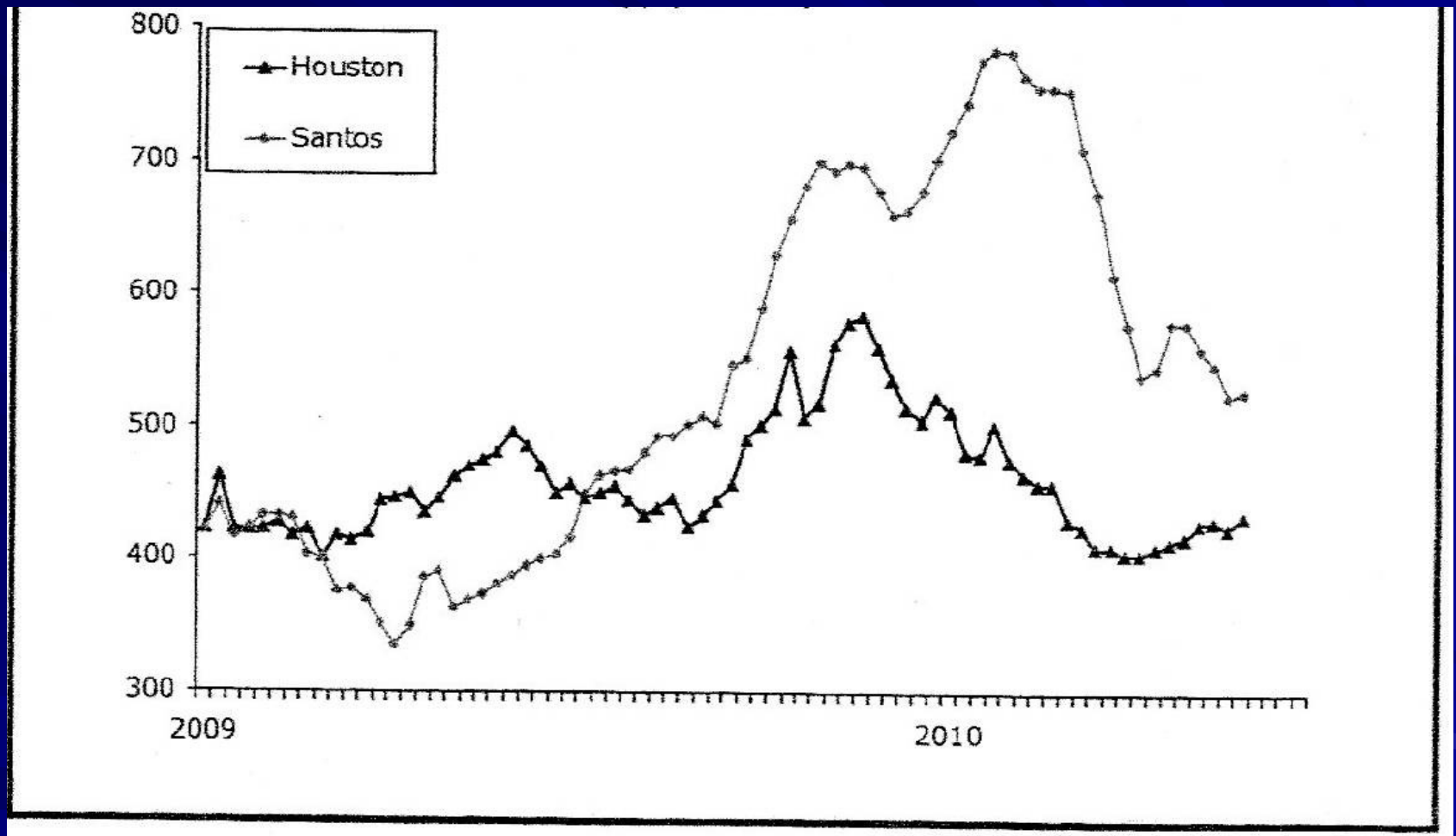

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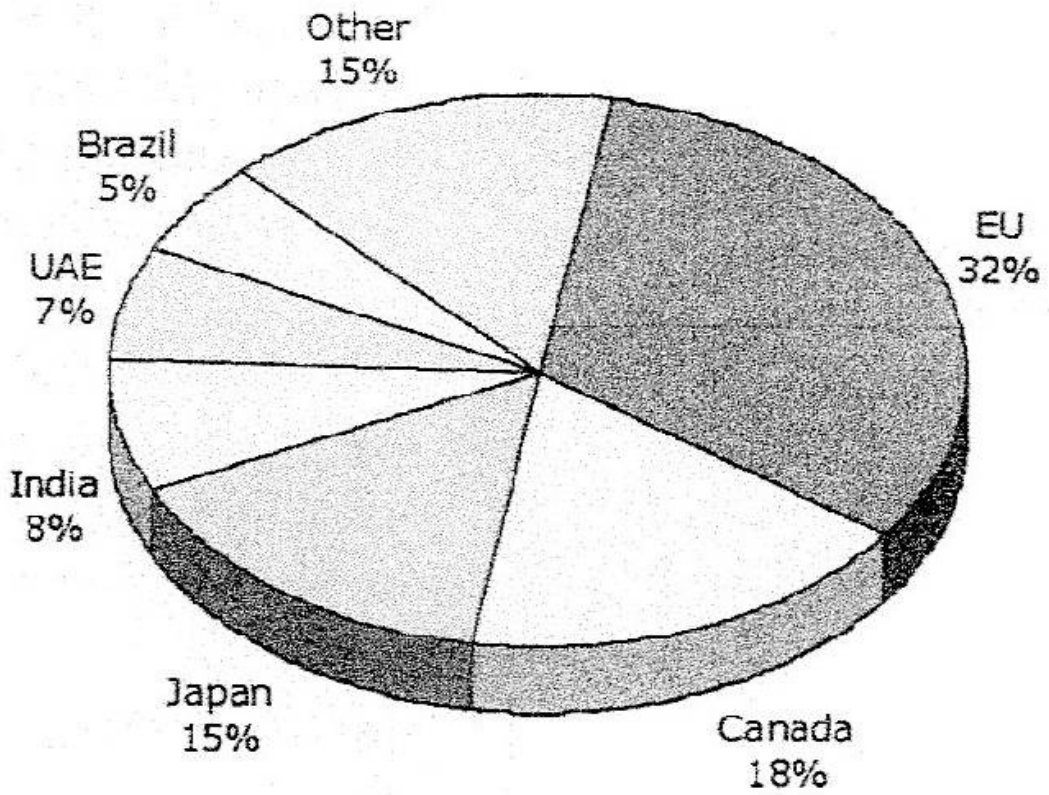
Fig. 2. USA – Ethanol Exports 2010 by destination, Jan/Apr (incl. ETBE)



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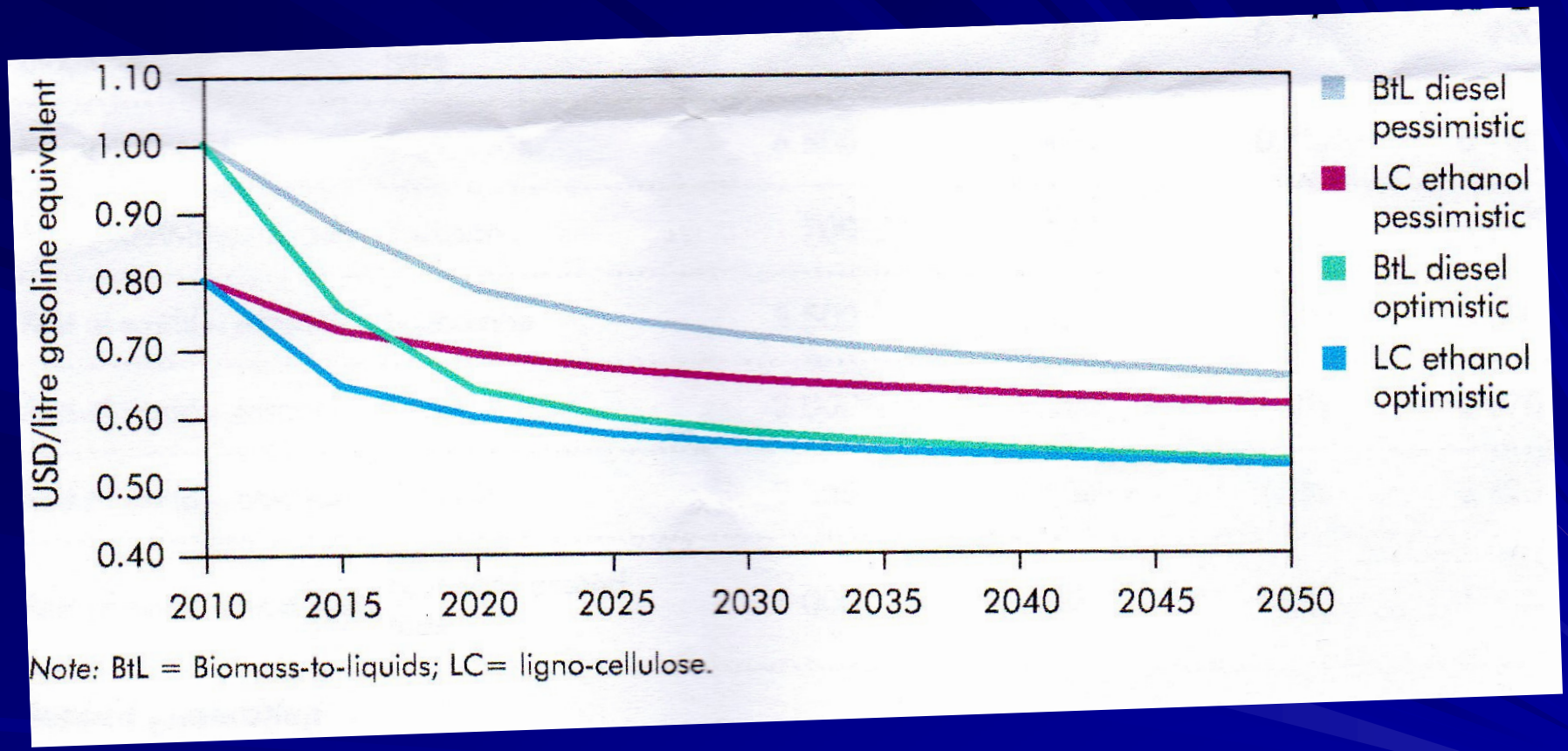
Problems that Biofuels are facing

- High cost of feedstock (~65%of the final cost)
- High cost for transformation of cellulose to ethanol. *(see fig. 3)*
- High cost for diesel production by BTL technology. *(see fig. 3)*
- Limited Environmental benefits to day…
- Social Problems mainly in the developing countries.
- Problems with the price of food and feed *(the year 2050 is estimated* that biofuels will cover the 3%-4% of the 6 b.Ha of the to day agricultural) .*

** Energy Technology Status and outlook 2008. IEA*

Figure 3 : Second generation biofuel production cost assumptions to 2050



Source: Dr Peter Taylor "Scenarios and Strategies to 2050" Energy Technology Perspectives 2008, I.E.A. /OECD

1st Conclusion

- E.U. is seriously behind U.S.A. in Biofuels Production and Consumption.
- The E.U. Biodiesel will be out of “sustainability criteria", because:
  - ✓ CO_2 : 45%
  - ✓ it is produced from food and feed.
  - ✓ the imported plant oils are coming from countries don’t respecting the “sustainability criteria” (social, food ,high C storage)
- The cost of Bioethanol production in E.U. is very high compared to international prices

SUSTAINABLE TRANSPORT BIOFUELS FROM SOUTH EUROPE

South Europe's common problems :

- **Serious unemployment***
- **Saturated market and competition from 3d countries for their basic agricultural products** *(tobacco, cotton…)*
- **Dried environment and competition for irrigation water between tourism, urbanism.**

* ***In S. Africa expected 700,000 new jobs from the introduction of ethanol (E-15) the year 2020.***

Table 5. The expected advantages from ethanol production by cellulose and Sweet Sorghum.

Crop	Annual yield (Liters/hectare)	Greenhouse-gas savings (% vs. petrol)[7]	Comments
Miscanthus	7300	37-73	Low-input perennial grass
Switch grass	3100-7600	37-73	Low-input perennial grass.
Eucalyptus	6000-12000(3), [5]	100-200	Plantation needs tropical or sub-tropical conditions. The better results need water. No frost resistant.
Sugar cane	6800-8000(6), [7]	87-96	Long-season annual grass. Only grows in tropical and subtropical climates.
Sweet Sorghum	2500-7000[4)] [5]	Same as sugar cane	Low-input annual grass, resistant to dry conditions cultivation from 50º North to 50º South
Corn	3100-4000[6] ,[7]	10-20	High-input annual crop. Cellulosic technology would allow Stover to be used and increase ethanol yield by 1.100-2.000 liters/ha

Source (except those indicated): Nature 444 (December 7, 2006): 673-676. [1] Savings of GHG emissions assuming no land use change (using existing crop lands). Modified

Picture 1. Experimental results from Sweet Sorghum in S.Italy(2007). Source: Eubia 2009 [26]

Total fresh weight

Australia seeds: NSS. 104 — 170t/ha (28000 ha)

Romania seeds: F135/1143 — 176 t/ha (24000 ha)

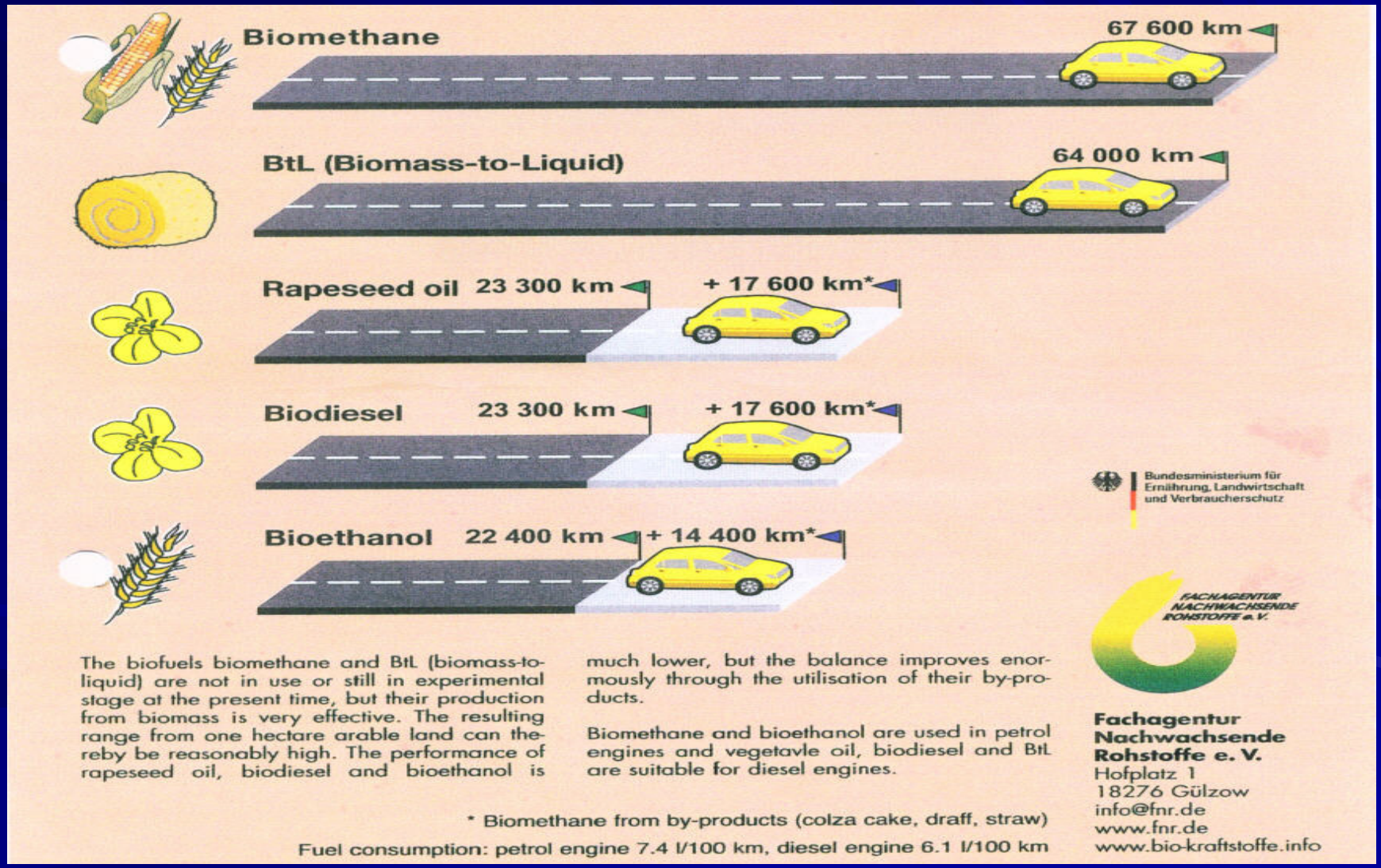
Germany seeds: (KWS) — 100 t/ha (21,000 ha)

High S.S. grains productivity: ~ 7.5 t/ha.

What S.Europe is expected from Sweet-Sorghum.

- Bioethanol production > 6t/ha
- Co-Production of grain for animal feed or for ethanol.
- Co-production of animal feed from papillionacae *(in rotation in the same year)* and from the by-products of fermentation.
- Nitrogen production from Vicia velosa in rotation.
- Irrigation water ½ of the corn requirements.
- Cost of Bioethanol 200-250E/m3.
- Co-production of Electricity from Bagasse *(attractive prices feed in tariff)*

Picture 2. Comparison of Energy production from 1 Ha cultivated with biomass.
Source: www.fnr.de



Biomethane is 8 times more efficient in Energy from corn bioethanol (R. Simson et al. Ren. Energy World, March 2010).

The environmental benefits are coming also from the effluents use in irrigation(~ 90% conservation of nutrients) and benefits also of using a pollutant waste for energy.

So, according JRC the compressed bio-methane is more environmental friendly from more than 70 different fuels and ways of energy production.

THANK YOU

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