

Is Biomass An Adequate Substitute For Oil

Liquid Fuel vs Solid Fuel Approaches

Christian Rakos

An obvious conclusion

- »» If we want to replace oil we need a liquid fuel with similar properties
- »» Consequently policies for replacing oil have focussed on producing liquid fuels
- »» Ethanol (from sugarcane, corn, grains etc.)
- »» Biodiesel (from palm oil, soybean oil, rapeseed oil etc.)

Unfortunately

- »» Production of liquid biofuels is expensive and energy consuming
- »» Plants need high inputs (fertilizers, pesticides)
- »» Conversion processes (especially Ethanol) need much energy
- »» Consequence: only 35% reduction of CO₂ (must be achieved according to EU legislation)

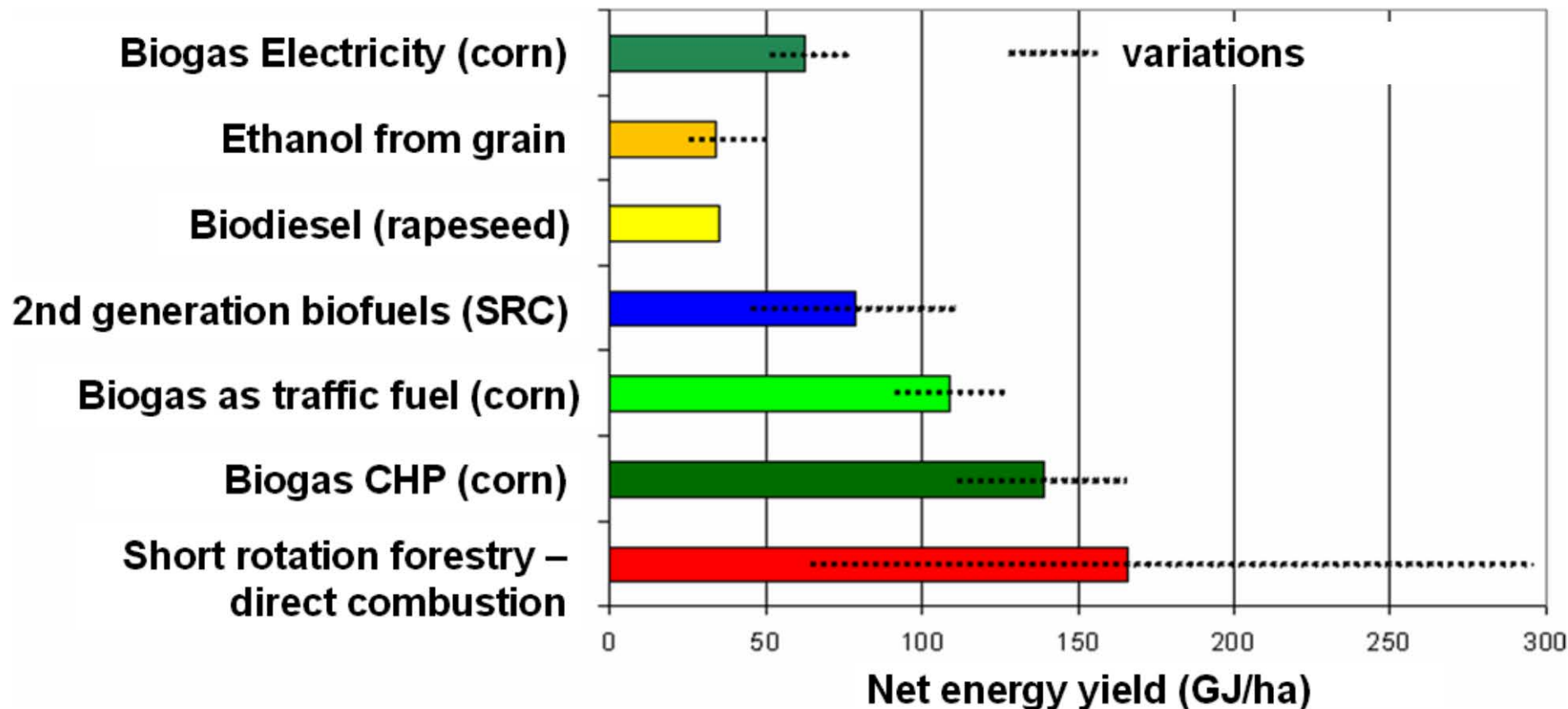
Disenchantment with bioenergy

- » Competition with food
- » High environmental impact
- » Poor EROI

Call for 2nd generation biofuels

- »» Ethanol from lignocellulosic materials (e.g. straw)
- »» Biomass gasification and synthesis of biofuels
- »» Both technologies not commercial yet
- »» Substantial costs and energy losses for conversion

Net energy yields of different ways to use biomass



Source: Sachverständigenrat für Umweltfragen, Berlin 2006

Why not replace oil with solid biomass where that can be done?

- »» Generation of room heat and commercial / industrial heat is the largest energy market in Europe!
- »» Oil use for heating in Europe amounts to 70 MTOE
- »» Use of wood as fuel is the largest contributor to RES use in Europe
- »» Economically viable and has excellent energy balance

Wood pellets – a solid fuel with liquid properties



Advantages of pellets

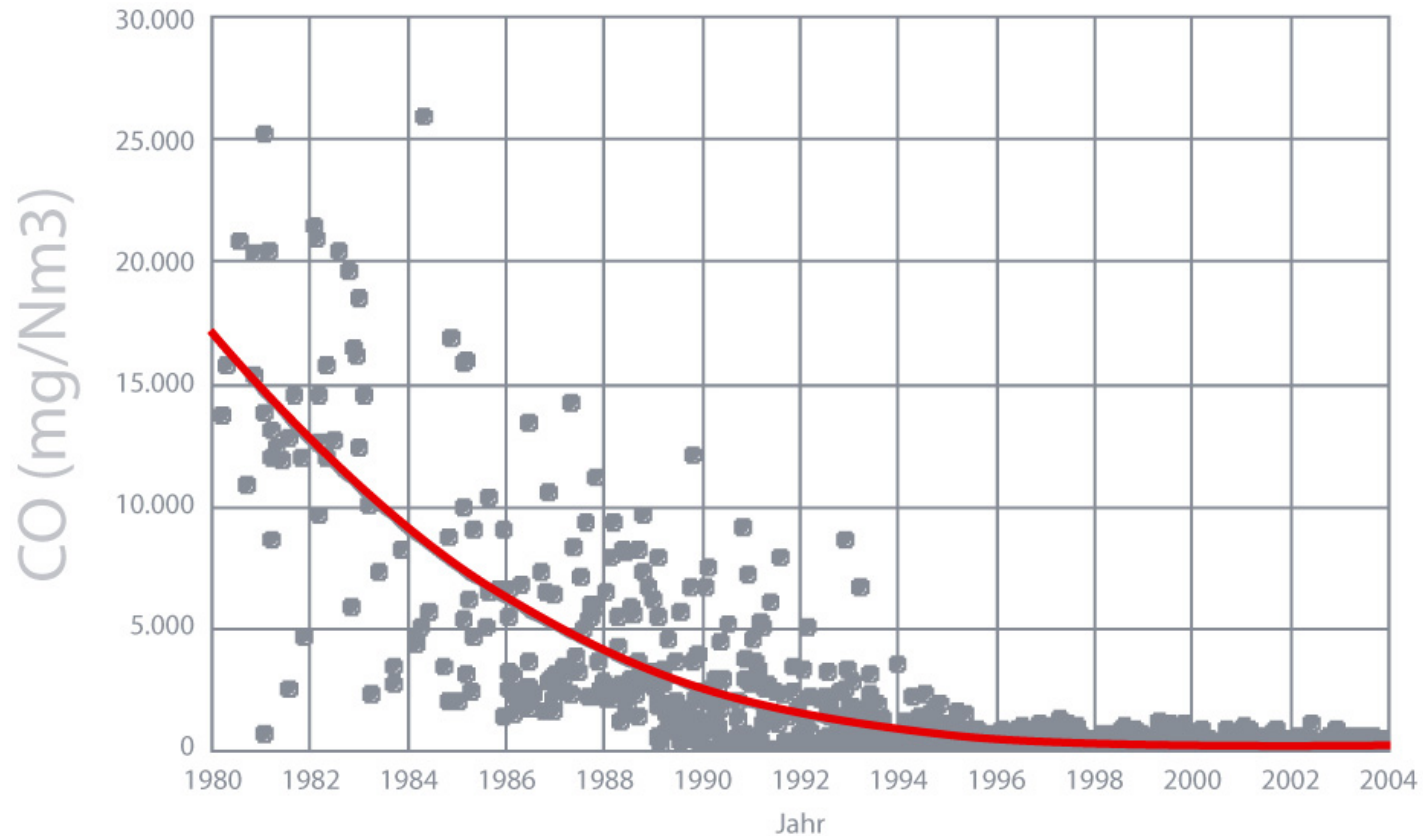
- » High energy density (5x higher than wood chips, ½ as dense as oil)
- » Clearly defined properties – standardizable fuel
- » Liquid properties – easy mechanical or pneumatic feeding
- » Perfect replacement of heating oil
- » 97% reduction of GHG (Austrian pellet industry)

Residential pellet furnaces

- » automatic fuel feeding, ignition and cleaning of heat exchangers
- » Ash removal 1-4 times per heating season
- » > 90% efficiency & extremely low emissions
- » Cost approx. 12.000€



Development of wood fuel combustion technology in Austria: emission reduction by a factor of 1000 !



Entwicklung der Emissionen von österreichischen Holzfeuerungen, gemessen an der Bundesanstalt für Landtechnik Wieselburg (BLT), 2005

**Pellet boilers work like oil boilers:
automatic fuel feeding from storage**



**Fuel delivery with trucks –
pellets are blown into the storage**



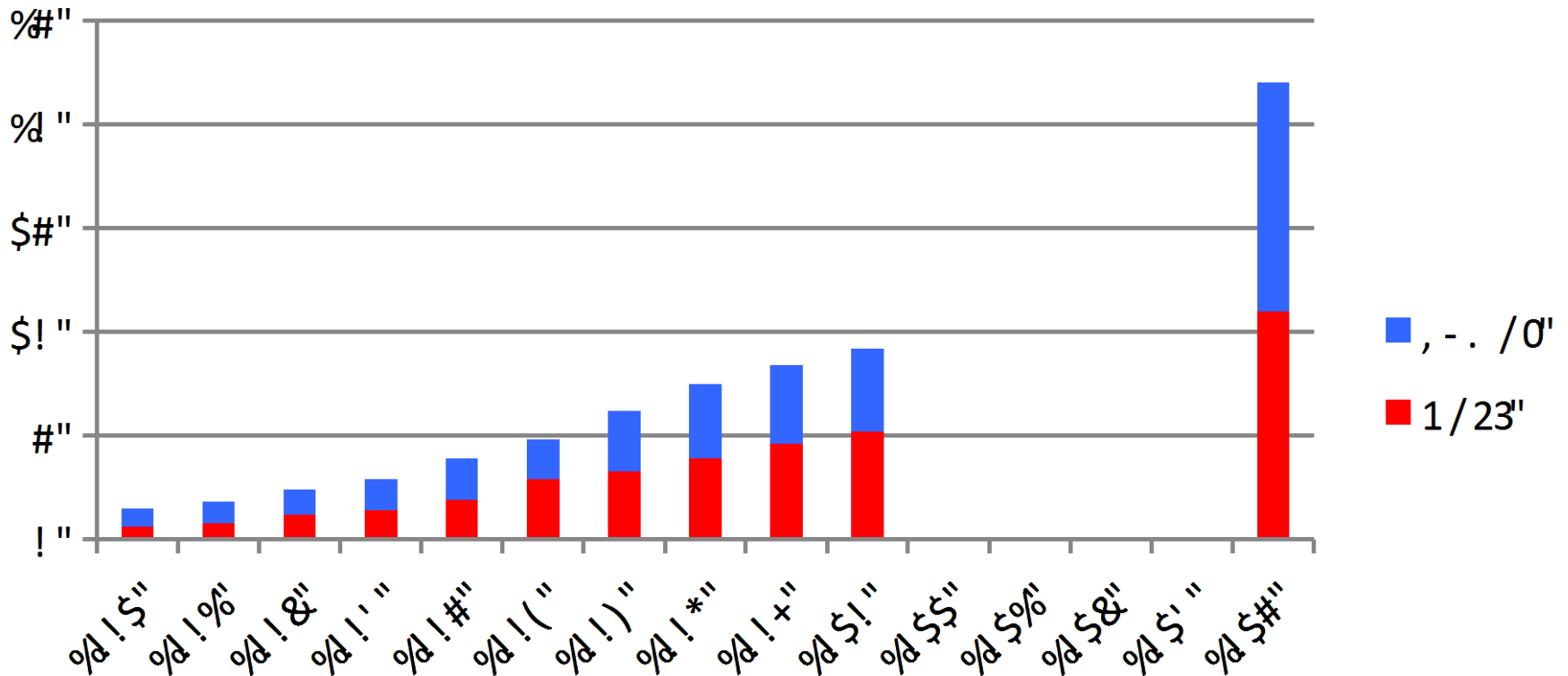
Pellet Stoves: room heater

- » filled with bagged pellets
- » Electric ignition
- » fully automatic operation, 85-90 % efficiency
- » Ash removal every 1-2 weeks
- » Costs aprox. 2000€



Pellets use in Europe grows at 20% p.a. and will exceed 20 Million tons by 2015

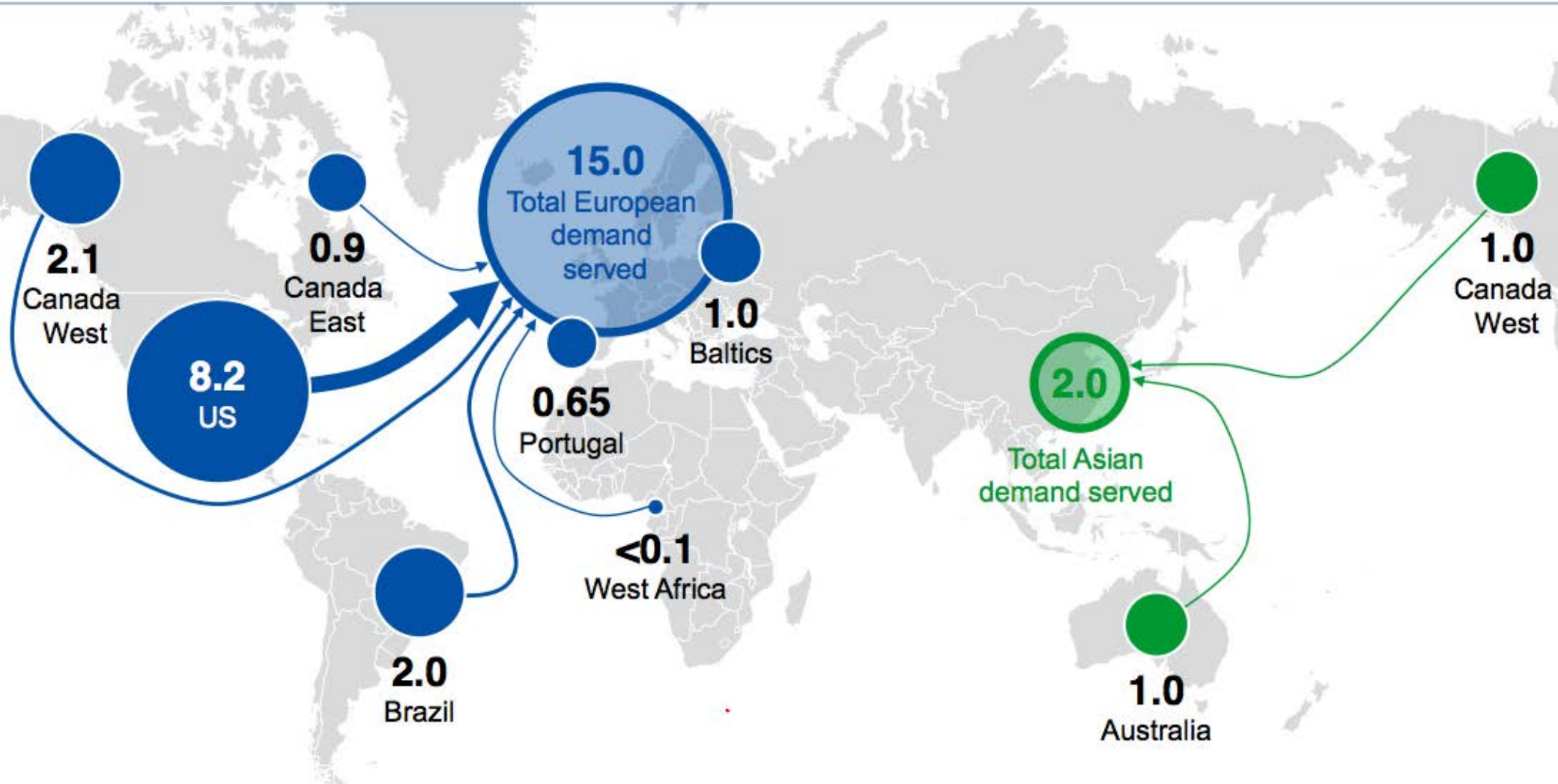
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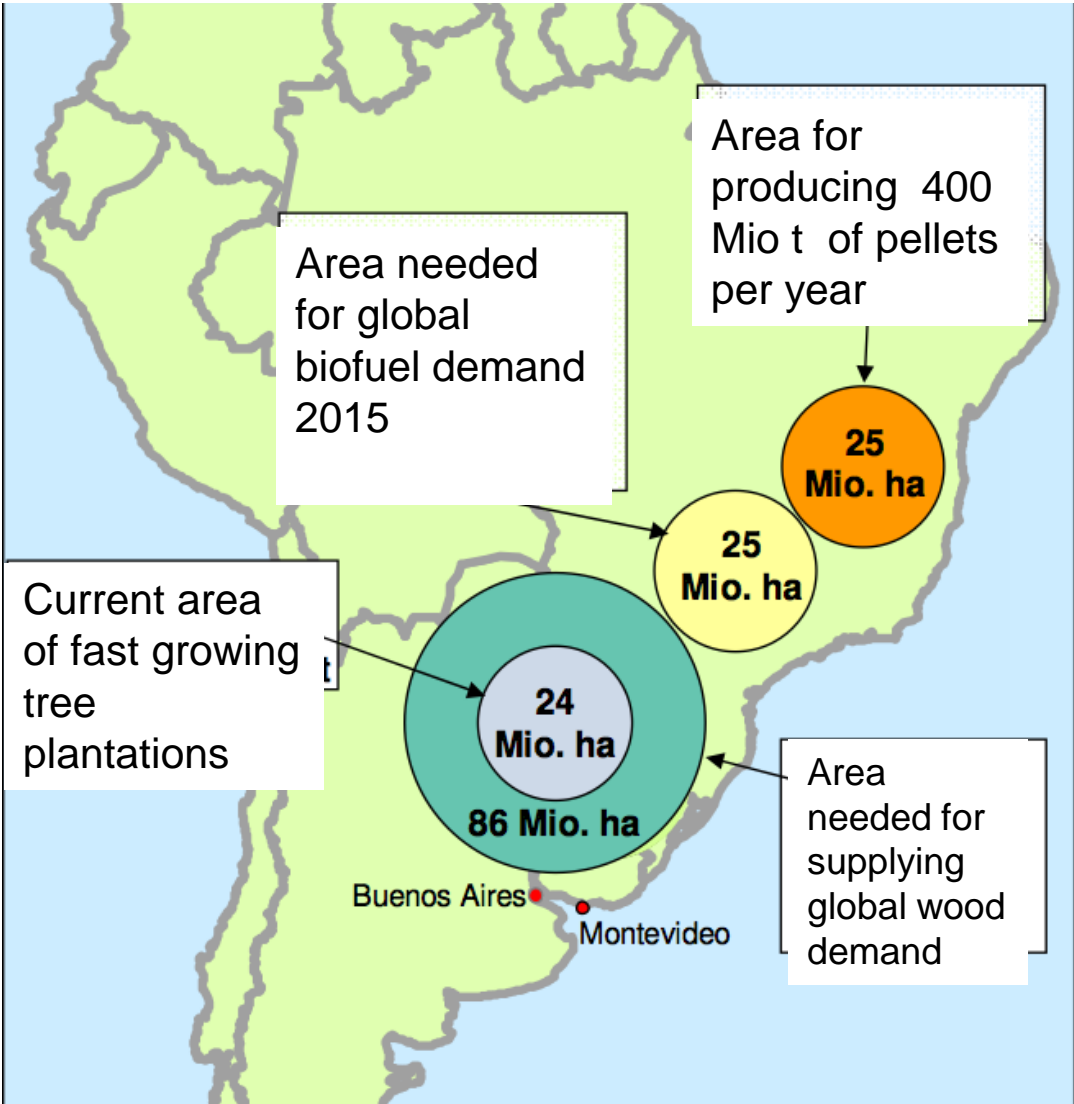
Pellet use for power

- » Pellets can be cofired in pulverized coal power stations to reduce CO₂ emissions
- » Low capital investment, cheap green electricity
- » Relatively high conversion efficiency (40%) but usually no heat use
- » Massive growth expected
- » International sourcing of product

Expected world trade flow – 2015 in million tonnes



Potential of fast growing tree plantations



Source:
Röder, Pöyry 2008

Is global sourcing of pellets sustainable?

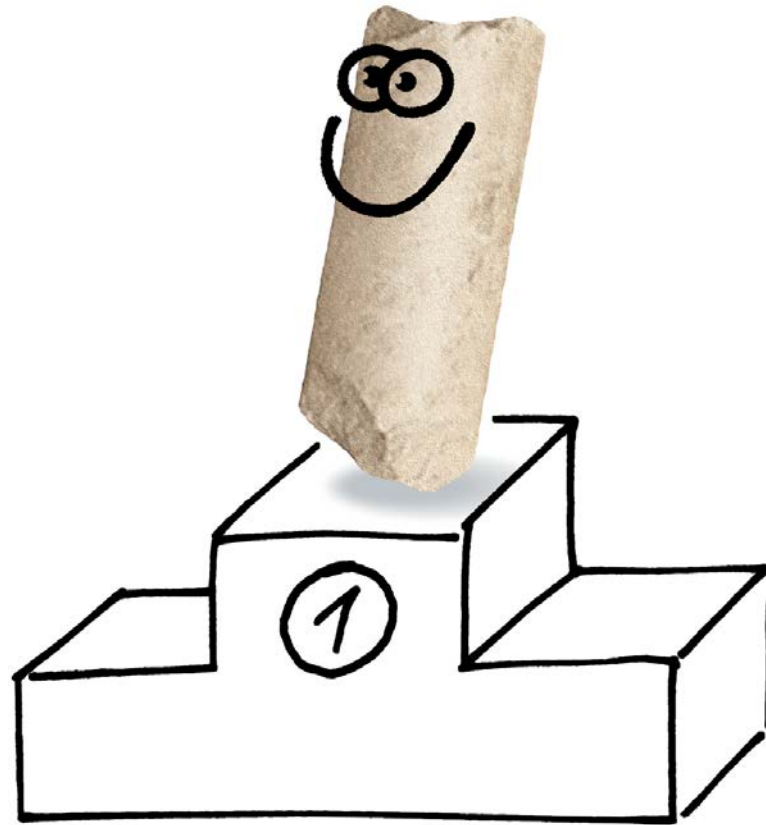
- » NGOs say NO!
- » Can sustainability certification ensure biomass is produced sustainably?
- » Economic development perspective for countries in tropical regions considerable – trees for development or destruction of last primary forests?
- » Great efforts will be made to ensure it is sustainable

Conclusions

- » Solid biomass fuels, particularly pellets have the potential to play a significant role in future energy supply
- » Their performance is much better than liquid biofuels
- » This fact is largely ignored by policy makers
- » The heat market does not receive any policy attention yet

Nevertheless things are moving

- » Excellent status of technology
- » Double digit industry growth
- » Supply chains are getting more robust
- » Consumers start seriously looking for alternatives for heating oil
- » **Solid biomass will be able to replace considerable amounts of oil!**



Thank you for your attention!