

# Agrofuels\* between Sustainability and Development

Interdisciplinary Analysis - Holistic Approach

\* =Biofuels

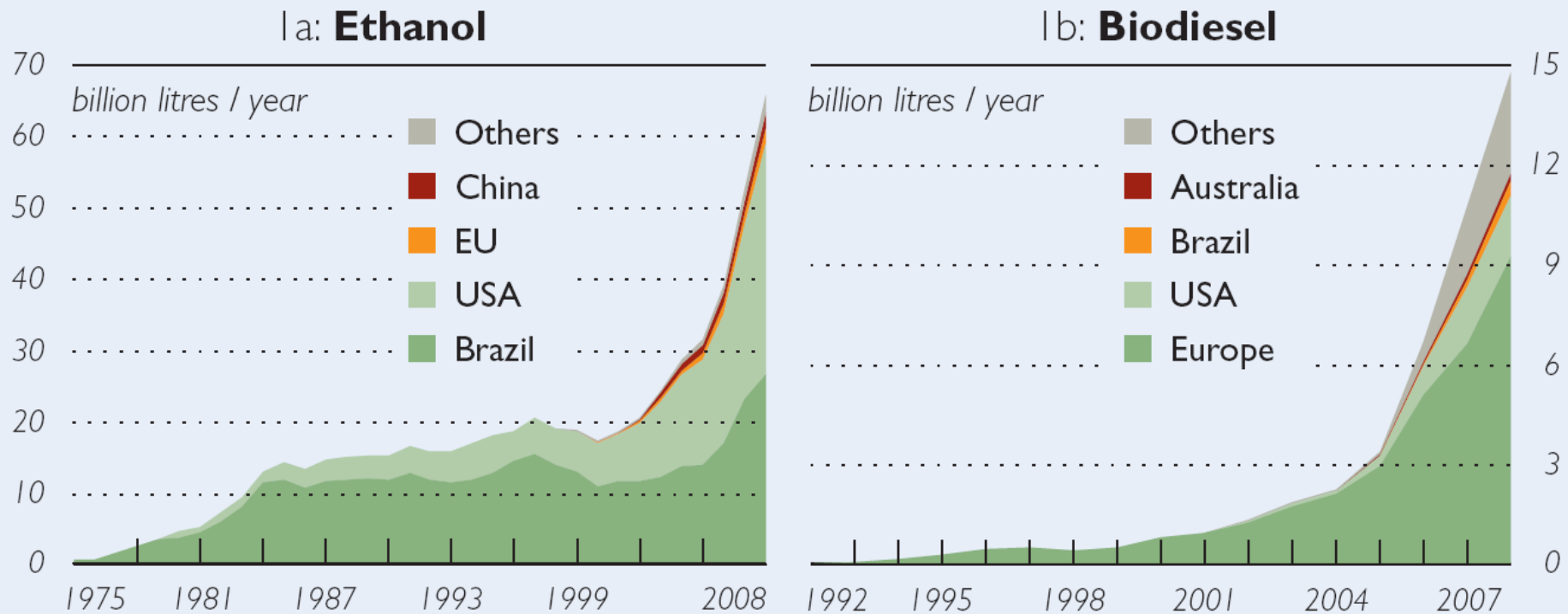
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## World fuel ethanol and biodiesel production

Figure 1

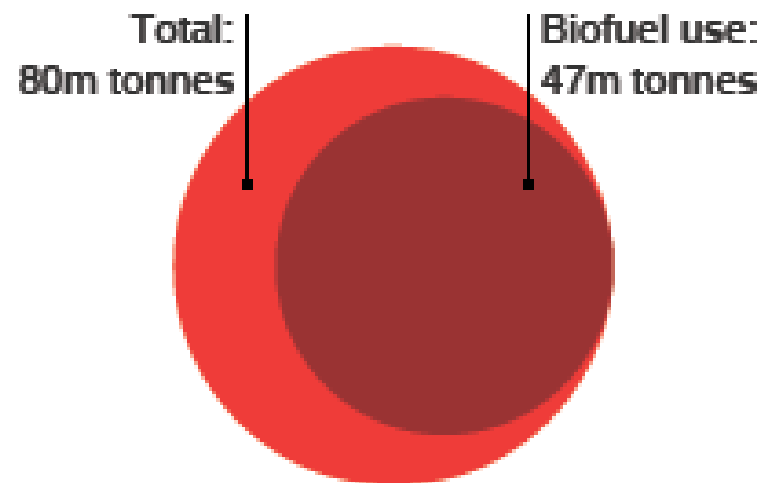


Source: F.O. Licht World Ethanol & Biofuels Report. October 2007 and May 2008.

Source: IIASA/OFID, March 2009

### DEMAND FOR BIOFUELS

Rise in use of coarse grains 2005-7



Use of vegetable oil 2005-17 (tonnes)

- ♦ 2005 - 96m
- ♦ 2007 - 105m (+9.2%)
- ♦ 2017 - 143m (est) (+49.5%)

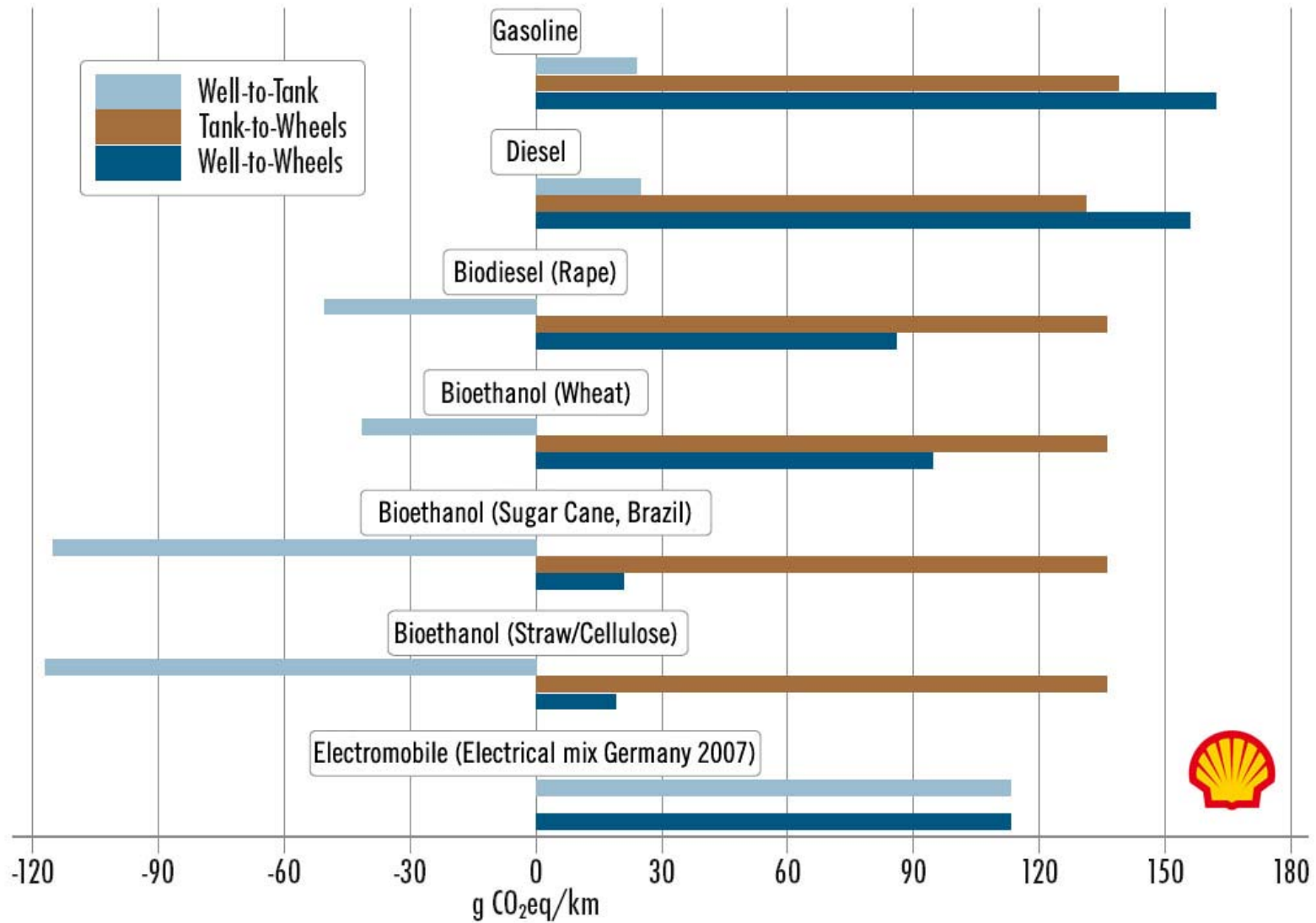
*Of which for biofuel:*

- ♦ 2005 - 4m
- ♦ 2007 - 9m (+113.9%)
- ♦ 2017 - 21m (+388%%)

SOURCE: FAO/OECD

## Biofuel chances...

- Reducing GHG emissions
- Diminishing dependency on oil – energy security
- National net value added
- Creating income and employment in rural areas
- A chance for developing countries (generating income, development of export markets)

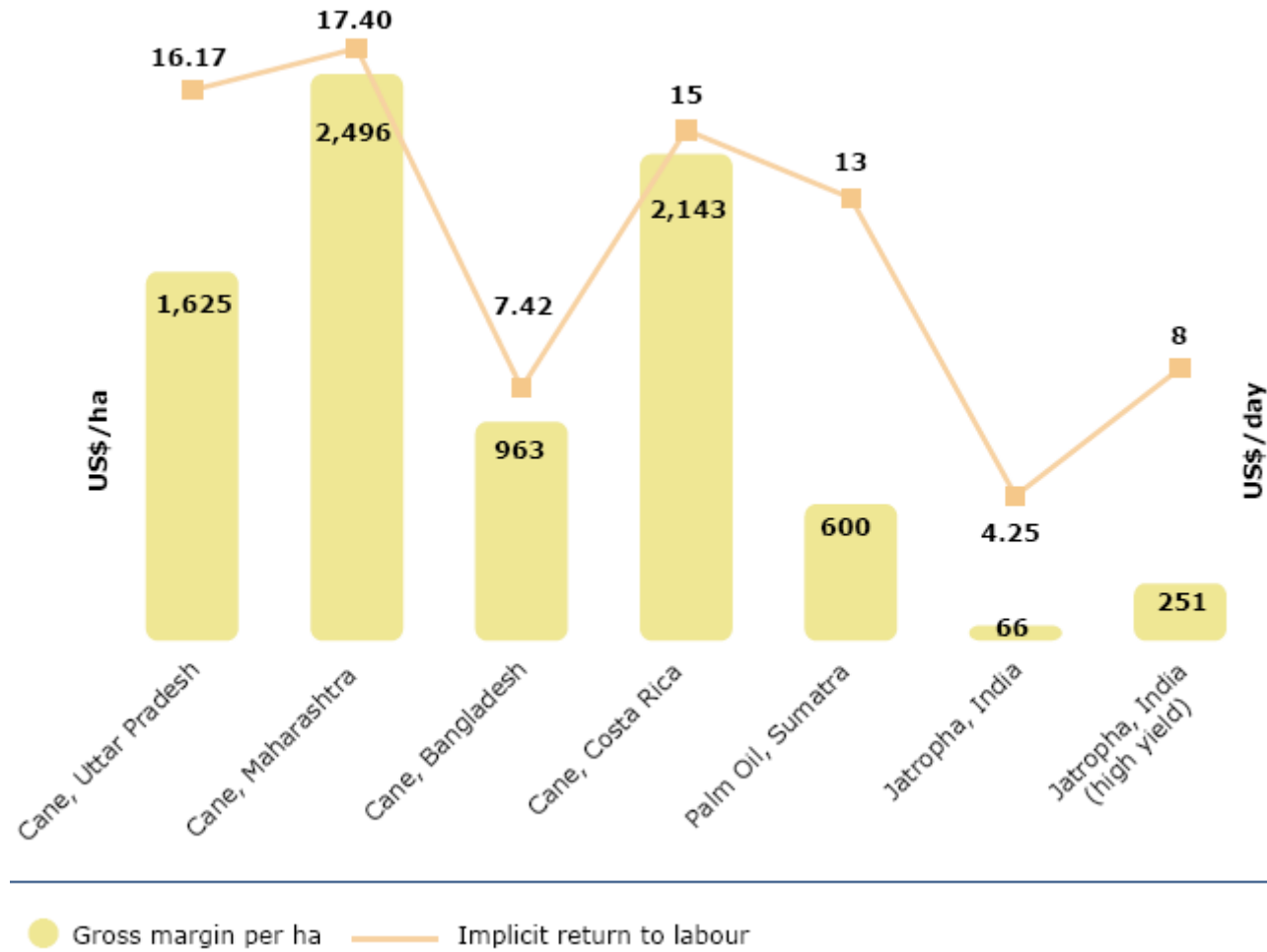


## ...challenges

- Food versus fuel production
- Various GHG saving potentials, according to different feedstocks – sometimes even negative
- Low efficiency (0,5 - 1,5% Sun > Biomass, 35-65% loss Biomass > Biofuels)
- Loss of biodiversity due to extensive agriculture (e.g. large monocultures, herbicides, pesticides)
- Misinterpretative terminology > „Biofuels“

## Additional challenges in developing countries

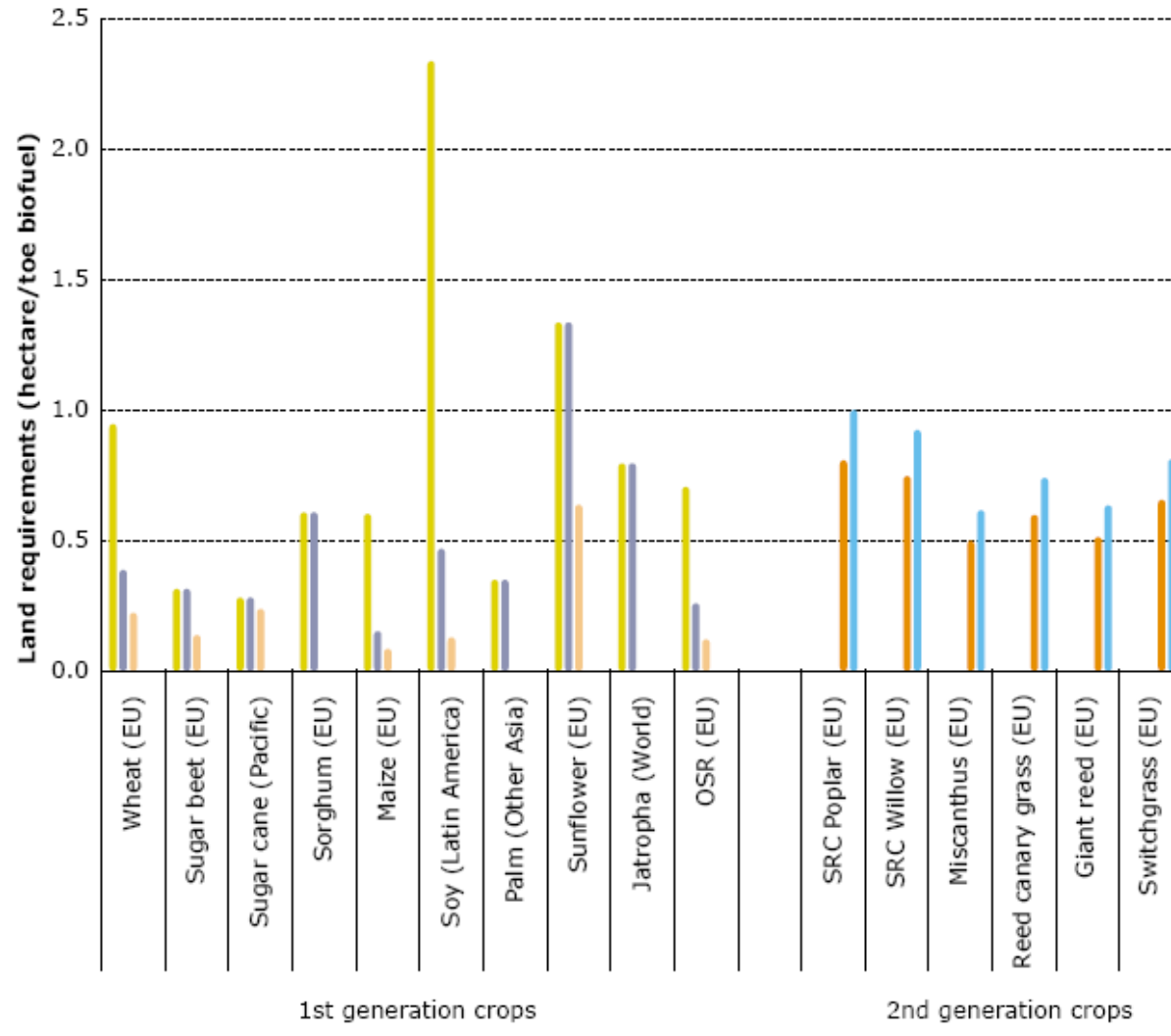
- Access to land – displacement of poor
- Little or no legal oversight of labor and environmental standards
- Policy makers are asked to precipitate fairness
- Ecological neo-colonialism as a threat
- Rising food prices – UN MDG's accomplishable?
- Land use change
  - Loss of traditional local land use
  - Ecological implications
  - Additional GHG emissions





## Do we have enough (Idle and marginal) land?

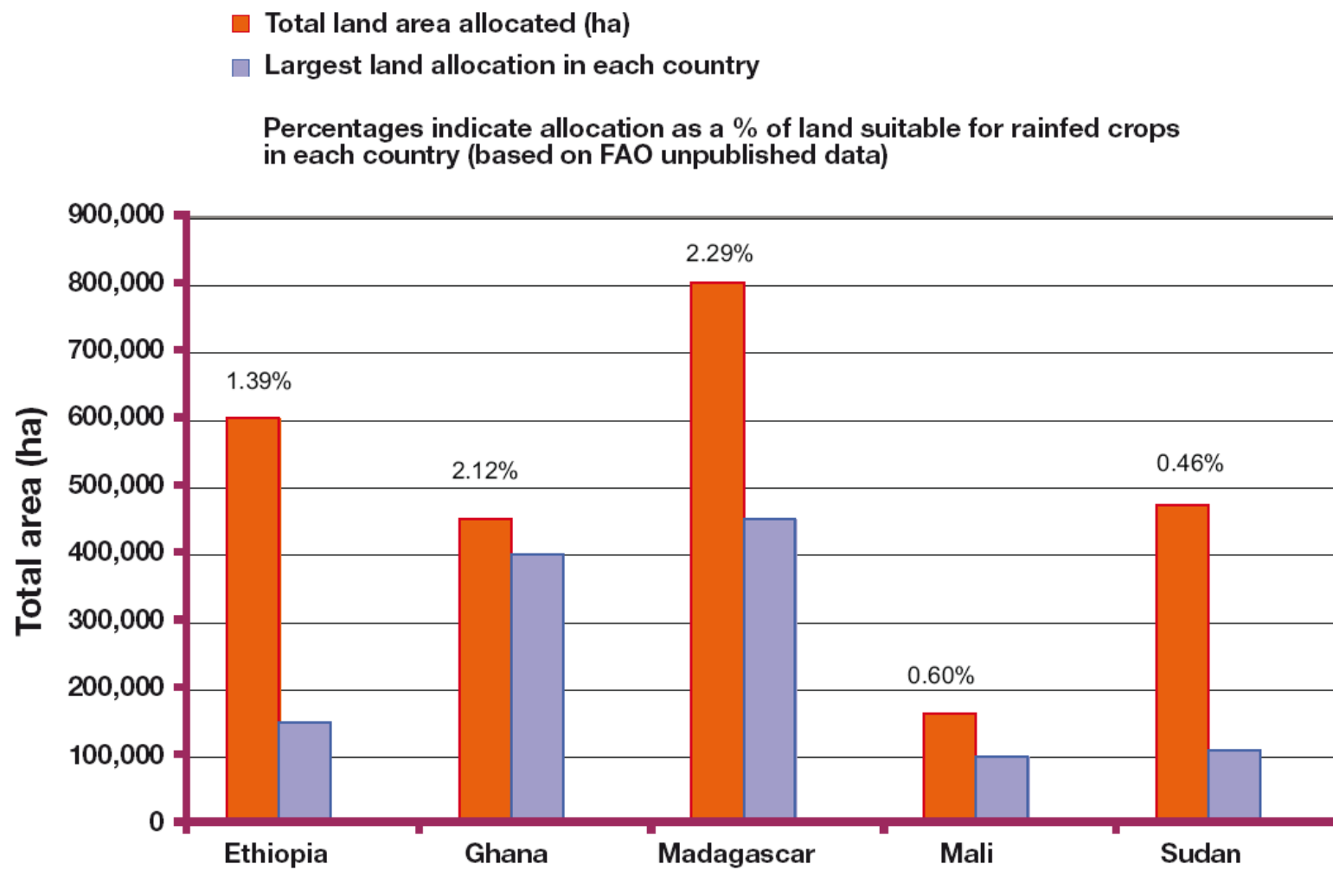
- Develop definitions for idle and marginal land
- Sustainability assessment
  - Existing use
  - Productive potential
  - Net carbon impact
  - Existing (environmental, spiritual, ...) value
  - Social implications
- Only a proportion of idle and marginal land should be used



- LU without co-product LU avoidance
- LU with co-product LU avoidance
- LU with co-product LU avoidance and agro residues utilisation
- Second generation crops (ethanol)
- Second generation crops (syndiesel)

Source: Ecofys 2008b in  
Gallagher Review 07/2008

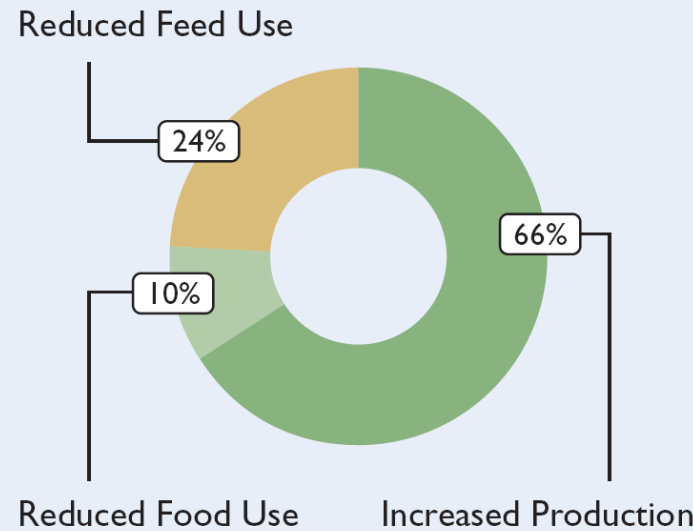
**FIGURE 2.5. LAND AREA ALLOCATED TO INVESTORS, 2004-EARLY 2009**



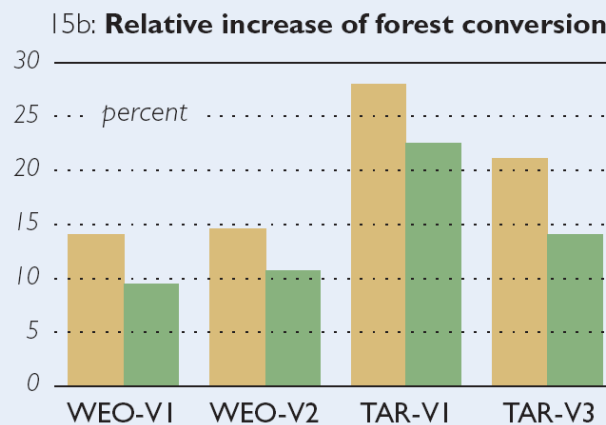
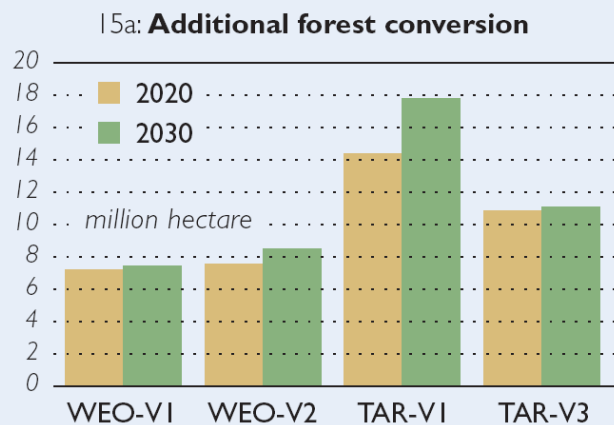
**Where do the cereals needed for biofuel production come from?** Box 4

On average about two-thirds of the cereals used for ethanol production are obtained from additional crop production.

The remaining one-third comes from consumption changes. The reduction in direct cereal food consumption accounts for ten percent of the amount of cereals used for biofuel production, reduced feed use accounts for about a quarter.



**Additional forest conversion in different biofuels scenarios** Figure 15



## Holistic approach

- Improvement of efficiency of given systems
- Efficient transportation and drive systems (individual and mass-transport)
  - > Governmental incentives required
- Biomass (Gas, Fuel etc...) for the mid-term, niches for long-term; sustainability criteria implied
- Solar, Wind, Water, thermal energy in the long-run (current PV efficiency ~ 15%)
- >> Final destination: Intelligent Mix



## Precautions in developing countries

- Biogas plants, solar energy, wind parks, water turbines
  - Small scale plants for remote areas
- Decentralised network architectures
- Consideration of microcredit models where appropriate to finance projects
- Legally binding contracts to ensure long term markets
- Organic agricultural methods and agroforestry (e.g. Jatropha – Pepper in Ethiopia)

## More information/further reading:

- <http://www.oeaw.ac.at/kioes/>
- <http://www.kef-online.at>

Thank you for your attention!