Saving Reed Beds by Giving economic value to Reed

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Reed as a Renewable Resource
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Context

Reed beds:

- Occur on all four continents mostly in marshy, sometimes brackish, areas in delta's, floodplains and lake beds.
- Are a valuable natural resource, often in nature areas and wetlands.
- Are in many ways valuable and worth conserving.
- May in the future naturally extend; (melting permafrost's?).

Simultaneously we face global challenges to:

- Develop renewable energy sources.
- Double food production by 2030 (MDG/FAO)
- Reduce CO_2 and methane emission (climate change).
- Protect and conserve nature, including wetlands.

Our problem

The conditions for meeting these challenges are in many cases contradictory!

Todays questions:

- Can Reed beds contribute to meeting the challenges?

And if yes:

- Can we prove that there is economic value in reed beds so that it is commercially/politically interesting to exploit, save and protect them?

An added problem: Reed beds are under threat!

- The locations of extensive reed beds are often attractive for human economic activities and are consequently under pressure from population and urban growth (megacities), which require space for infrastructure, industry and local food production.
- Progressive reclamation of the reed growing areas to create space for these activities is a logical consequence and thus a threat to the reed growing areas.

The economic interests to reclaim are larger than the supposed economic value of reed growing areas !

What are the functions of reed beds?

Reed beds fulfill valuable natural functions such as:

- Protection against wave action and erosion.
- Natural water purification, including break down of oil residues (helophytes).
- CO_2 /methane storage.
- Provide raw material for roof thatching, basket and screen production (cottage industry).
- Breeding and resting place birds, fish crustaceans etc., contributing to biodiversity.(Nature Value)

Potential commercial use of reed

Reed can serve as a commercially attractive renewable feedstock for the production of:

- **Energy** (combustion:→steam→ electricity).
- Biogas
- **Bio ethanol.**
- **Charcoal substitutes.**
- **Bio coal**

The fibers of reed are, or can become, commercially attractive raw material for the production of:

- **Pulp and paper.**
- **Building materials (Fibre Board)**
- Roof thatching, baskets, screens, handicrafts etc.(small scale).
- Textiles (to be developed).

Can a commercial large scale exploitation of reed be harmonized with the global challenges?

Reed beds are:

- Marshy, often brackish
- Nature areas; specifically wetlands.
- Stores of vast quantities of CO_2 which are released if reclaimed.

Reed growing areas are not:

- Suitable for food production unless expensively reclaimed.
- Making demands on additional scarce fresh water resources.

Reed exploitation :

- Does not compete with food production for land+ fresh water.
- Can provide renewable energy.
- Safeguards nature areas, harvesting, if judicially done, is not harmful for environment/ ecology.
- Does not interfere with natural functions of reed beds including storage of CO_2 and methane in root zone.
- Meet global challenges.

Conclusion

Commercial exploitation of reed can, if judicially done, can be harmonized with global challenges and will contribute towards meeting these.

Once reed is recognized as having a commercially interesting economic value, cultivation and processing technology will be further developed and optimized.

Present exploitation of reed

- Traditional exploitation of reed is on-going but only on a limited scale.(baskets, roof thatching etc.).
- Industrial use of reed for pulp (Asia) declining because of pollution by traditional pulp processing plants.
- Modern non-polluting exploitation mainly limited to experiments and pilot scale.
- So far: besides pulp no systematic large scale exploitation

Potential stakeholders (governments, farmers and commercial parties) have not realized the huge potential of reed as a commercially viable resource with positive spin-off for all concerned.

Status processing technology for commercially attractive exploitation

- **Non-wood pulp**: recently new proven non-polluting processes developed-not yet implemented on large scale.
- **Bio-ethanol:** Industrial scale processes are at last stage of development(2013/2014 crucial !).
- **Fibre board:** proven existing processes.
- **Direct electricity generation**: special equipment required for high silica and ash content equipment has been developed.
- **Pelleting equipment**: commercially available (small scale).
- **Charcoal replacement**: for small scale, equipment available.
- Textile (linen replacement): to be developed.

The Challenge

Make exploitation of reed for energy or other uses commercially attractive,

so that reed beds are recognized as a valuable resource to be properly maintained.

When is reed commercially attractive?

Criteria

- Market demand end-product
- Secure supply reed in quantities to feed economically sized plant.
- Price of end product.
- Required investments.
- Processing cost.
- Cost raw material (reed)
  - Harvesting cost
  - Transport cost
  - Other Charges

Conditions

- Clear demand, preferably growing, non controversial .
- Annually considerable (adequate) quantities of reed.
- Return on capital >20%
- Cost of reed delivered ~$70/ton (present situation)
- Competitive with alternatives

Main challenge for reed supply

- "**SCALE**": Secure availability adequate quantities of reed
  - Pulp: 350 000 t/y; Ethanol: 250 000 t/y; Fibre board: 60 000 t/y ; Pellets: 60 000 t/y; Electricity: 150 000 t/y.
  - Large concentrated areas where reed is growing.
- "**COST**" :Low cost of reed delivered to processing plant:
  - Low cultivation cost (inherently realized)
  - Low harvesting and bundling cost (to be further developed)
  - Low transport cost (short distances + accessible roads)
  - Processing close to reed fields.
- "**QUALITY**": Good quality reed (uniform and for some application low moisture content).

Commercial data for minimum economic capacity processing installations(indication only)

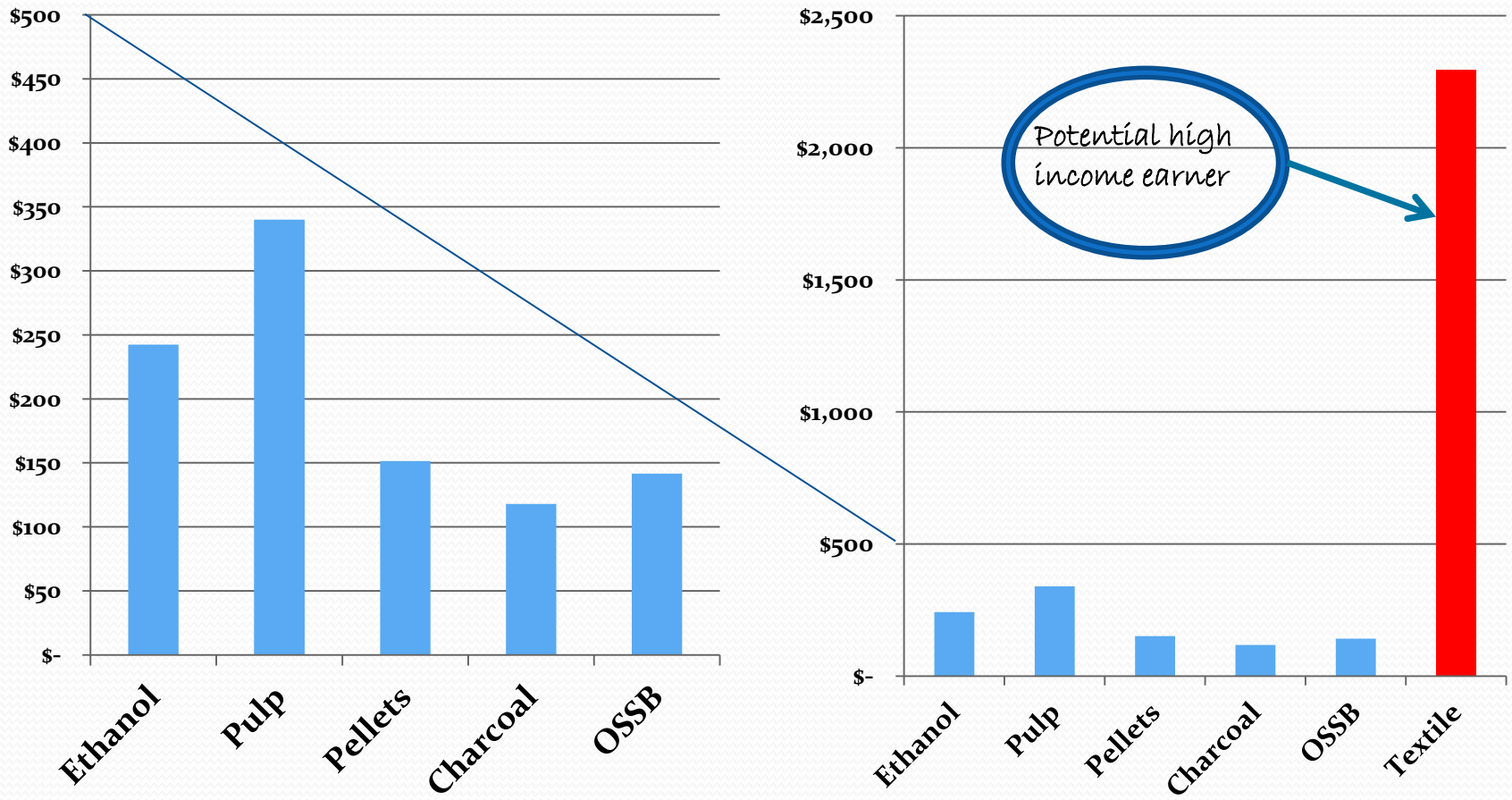
Based on return on investment of 20% and cost of reed at plant gate of $70/dry ton (data rough general estimates).

Product	Value	Capacity	Investment	Reed supply
	US$/ton	Ton/y	million US$	Ton/year
Pulp	90	150,000	$ 250.00	350,000
Ethanol	1,040	50,000	$ 200.00	250,000
Fibre board	310	38,000	$ 25.00	57,500
Pellets	110	60,000	$ 9.00	60,000
Charcoal	*225*	*3,000*	*$ 0.75*	*9,000*
	US$/MW	MW	million US$	Ton/year
Electricity	*130*	30	$ 45.00	150,000

Italic data: local general estimate can vary considerably !

Logistic Challenge: supply daily between 700 and 1000 ton reed!

Value created per ton of reed



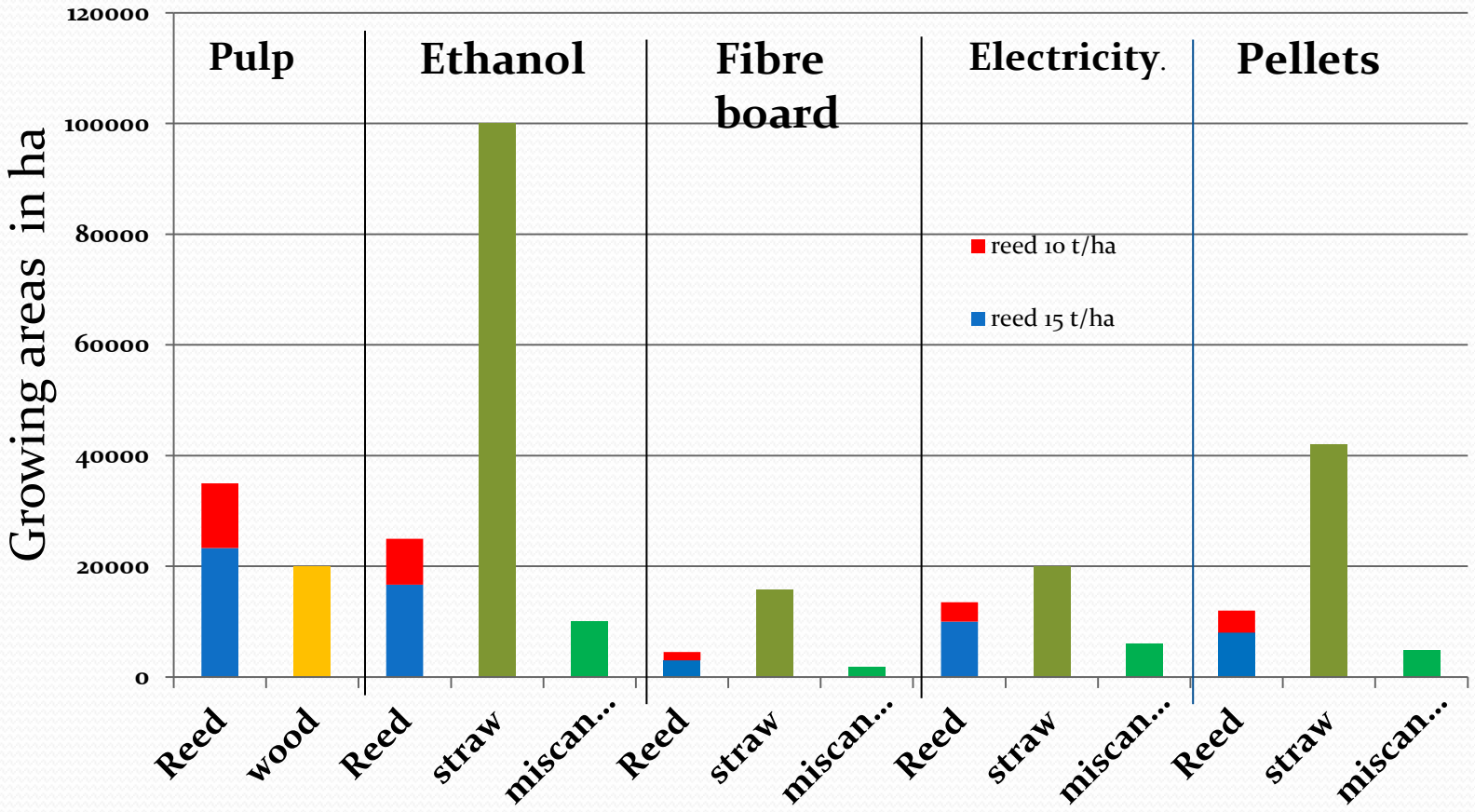
Reed compared to alternative raw materials

Production of: Ethanol , Pulp, Fibre board, Electricity, Pellets

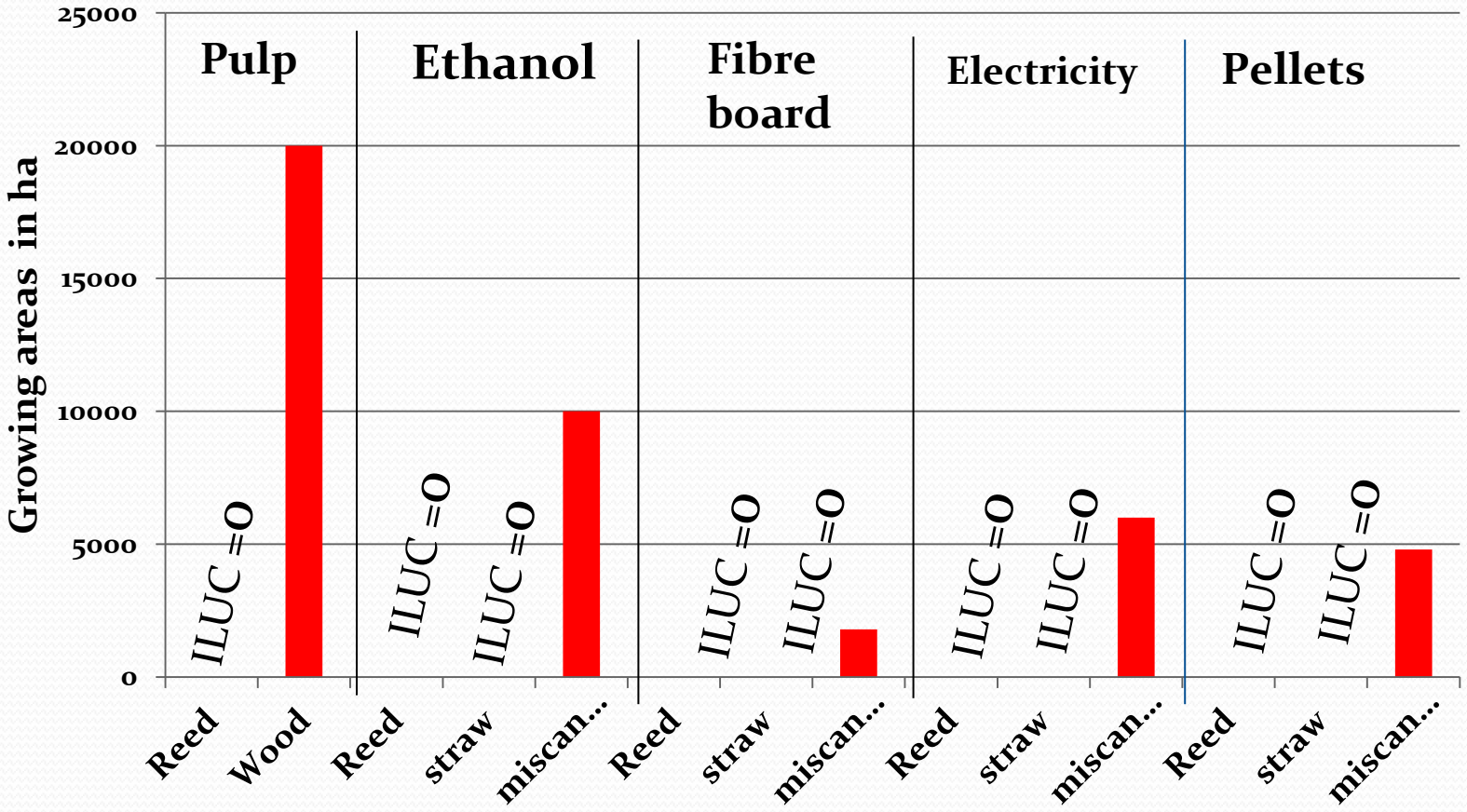
Advantages reed over alternative feedstock for renewable energy

Alternative feedstock	Reed as a feedstock
• Food crops wheat, maize etc.	• No competition with food uses of crops. • No competition for land and fresh water with food crops. • No competition for land and fresh water. ILUC= 0.
• Dedicated non food energy crops (biomass).	• No expensive infrastructure • No long lead times • No soil cultivation, weeding and agrochemicals.
• Harvest wastes and residues (biomass)	• Higher yield density (ton/ha) • Lower collection/transport cost.

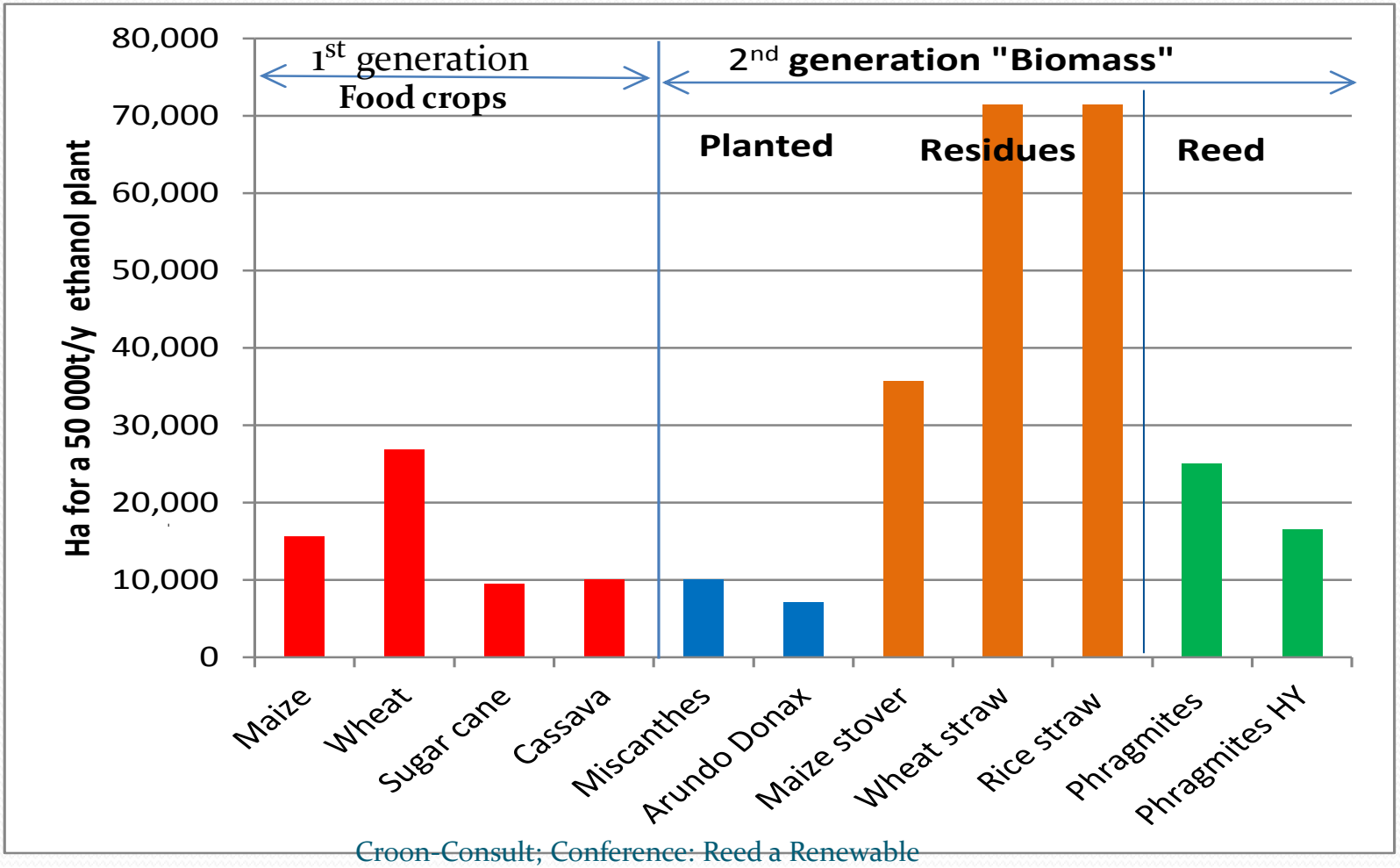
Comparison areas required to supply commercial sized processing plants



Indirect land Use Change (ILUC) as result of supply of commercial sized processing plant



Area required to supply 50 000 t/y Ethanol plant



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Conclusions of comparison with alternative raw materials

Reed:

- Is not in conflict with food production.
- Does not divert land use from food production. (ILUC=0)
- Maintains nature value of growing area.
- Is cheaper and simpler to cultivate than either food crops or dedicated biomass crops. (less energy use=less emission).
- Is cheaper and simpler to collect than harvest wastes /residues. (less energy use=less emission).
- Requires more area than dedicated crops but less area than wastes and residues.

Overall conclusions

- Giving economic value to reed will safeguard the reed beds and their natural functions.
- Reed can be harvested for use as a an attractive renewable energy source and raw material for ethanol, pulp, building materials and possibly textiles.
- To be commercially attractive :
  - Large quantities of reed are to be available within a concentrated area.
  - Cost of reed should be kept below around $70/ton.
  - Cost effective harvesting has to be further developed.

Recommendations

To make reed as a renewable resource attractive and create awareness of the potential, prepare:

- A worldwide inventory of large reed growing areas;
- An inventory of available species and their characteristics.

And develop and optimize:

- Low cost, site specific harvesting techniques;
- Optimize economically attractive non polluting processing techniques.

Conduct :

- Research programs to optimize species and yields under different conditions.

Success conditions

Intensive long-term non-competitive cooperation between:

- Academic world.
- Agronomic and industrial specialized research institutions.
- Industry; including industrial R&D.
- Investors and industrial operators.
- Environmental protection organizations. (NGO´s)
- Governments.
- International organizations (UN, EU, FAO, IEA etc.)

THANKS FOR YOUR ATTENTION

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