

PhD project:
Firms' sustainable choice of energy

Isabelle Brose

Promotor: Prof. Annick Castiaux
CSR day – 22nd February 2010



LOUVAIN
School of Management

EXCELLENCE & ETHICS IN BUSINESS

Context

- **Firms** must take into account **environmental** and **socio-economic impacts** of their activities and prove their **sustainability** in order to meet **stakeholders'** expectations.
- Fighting against **climate change** is part of sustainable development and imposes the mitigation of **GHG** emissions, especially in the field of **energy** production and use.



Context

- In order to **“green”** their energy consumption, firms have several **possibilities** which can be **mixed**:
 - **Optimizing** energy use,
 - **Buying** green/sustainable energy from suppliers,
 - **Producing** green/sustainable energy on their own or in collaboration with suppliers,
 - **Investing** in external and sustainable projects with partners.
- Each energy possibility presents **GHG** emissions but also **other** negative and/or positive environmental and socio-economic externalities.



Context

- Externalities are **by-products** which are not sold on market but which have impacts on stakeholders.
- As market “regulators”, **politics** try to make firms internalize their externalities in order to support positive ones and avoid negative ones.
- It is thus important for politics, as long as for **managers**, to **identify**, **assess** and **monetize** externalities.





TEXBIAG vs. thesis project

- TEXBIAG project "*Decision-making tools to support the development of bioenergy in agriculture*" develops three tools:
 1. A database of primary quantitative data related to environmental and socio-economic impacts of bioenergy from agriculture,
 2. A mathematical model monetizing bioenergy externalities,
 3. A prediction tool assessing the impacts of political decisions made in the framework of the development of bioenergy from agriculture on different economic sectors (energy, agriculture, industry, environment).
- Helping politics in selecting the most sustainable agricultural bioenergy scenarios to support



LOUVAIN
School of Management



CRA-W
Gembloux



Vrije
Universiteit
Brussel



BELGIAN SCIENCE POLICY



EXCELLENCE & ETHICS IN BUSINESS

Content

1. Critical **review** of existing studies and models on environmental and socio-economic impacts of bioenergy, and their monetization
2. Articulation of environmental and socio-economic externalities of bioenergy: A qualitative / quantitative **model**
3. Firms' sustainable choice of energy



Part 1

- **Critical review of existing studies and models on environmental and socio-economic impacts of bioenergy, and their monetization**
- Literature mostly interested by economic viability and **cost-effectiveness** of bioenergy routes (internal costs)
- Some environmental externalities sometimes taken into account (especially emissions)
- Some socio-economic externalities also considered (especially direct employment)
- At local or regional level (case study of local initiative)
- Externalities sometimes quantified but rarely monetized, even if methods to monetize externalities exist
- No model which integrates and assesses an exhaustive list of externalities from bioenergy



Part 2

- **Articulation of environmental and socio-economic externalities of bioenergy: A qualitative/quantitative model**
- A critical review of existing sustainability criteria initiatives and certification schemes

Cramer Commission	SAN/RA
RTFO	FSC
RSPO	PEFC
Basel criteria	ATFS
Utz Codes of Conduct	SFIS
EurepGAP – GlobalGAP	Eugene
IFOAM	GGL
	Öko-Institut



Part 2

- List of **externalities** or **sustainability criteria** quoted by initiatives reviewed and considered as relevant by experts consulted:

- TEXBIAG project follow-up committee members,
- Federal Public Service – Health, Food Chain Safety and Environment representatives,
- Members of Working Groups for European normalization – CEN/TC 383 “*Sustainability produced biomass for energy application – Renewable Energy Directive related criteria and indicators*”,
- Members of *ad hoc biomass* Working Group at Belgian Federal Council for Sustainable Development,
- Conferences participants.

- **Indicators:** consensus on externalities to take into account, but little information on indicators to measure these externalities



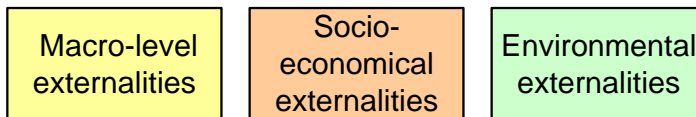
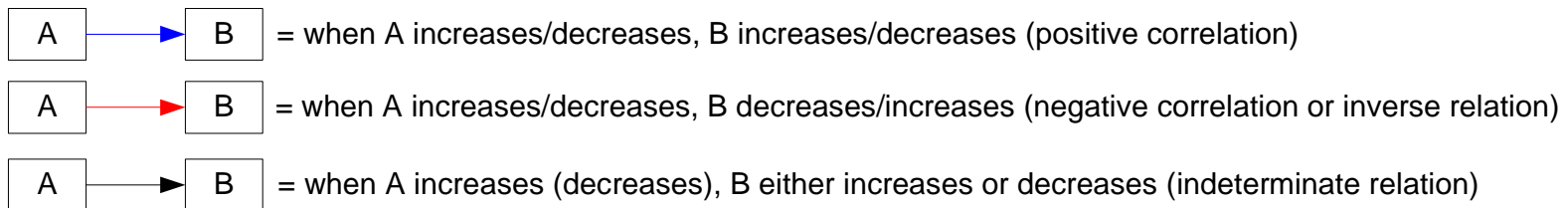
Part 2

Externalities	Sustainability criteria		Indicators
Environmental externalities	Global warming	GHG emissions	qn/Mon
		Carbon stocks	QI/qn/Mon
		Direct land-use change	qn/Mon
	Environment quality	Air quality	QI/qn/Mon
		Soil quality	QI/qn/Mon
		Water quality	QI/qn/Mon
		Agricultural practices (agrochemicals use)	QI/qn/Mon
	Biodiversity	Biodiversity	QI/qn/Mon
		GMO	QI
Socio-economical externalities	Local prosperity		qn/Mon
	Social well-being (incl. working conditions)		QI
	Property rights		QI
	Competition with food		qn
	Energy security		QI/qn
Macro-level externalities	Indirect land-use change		?

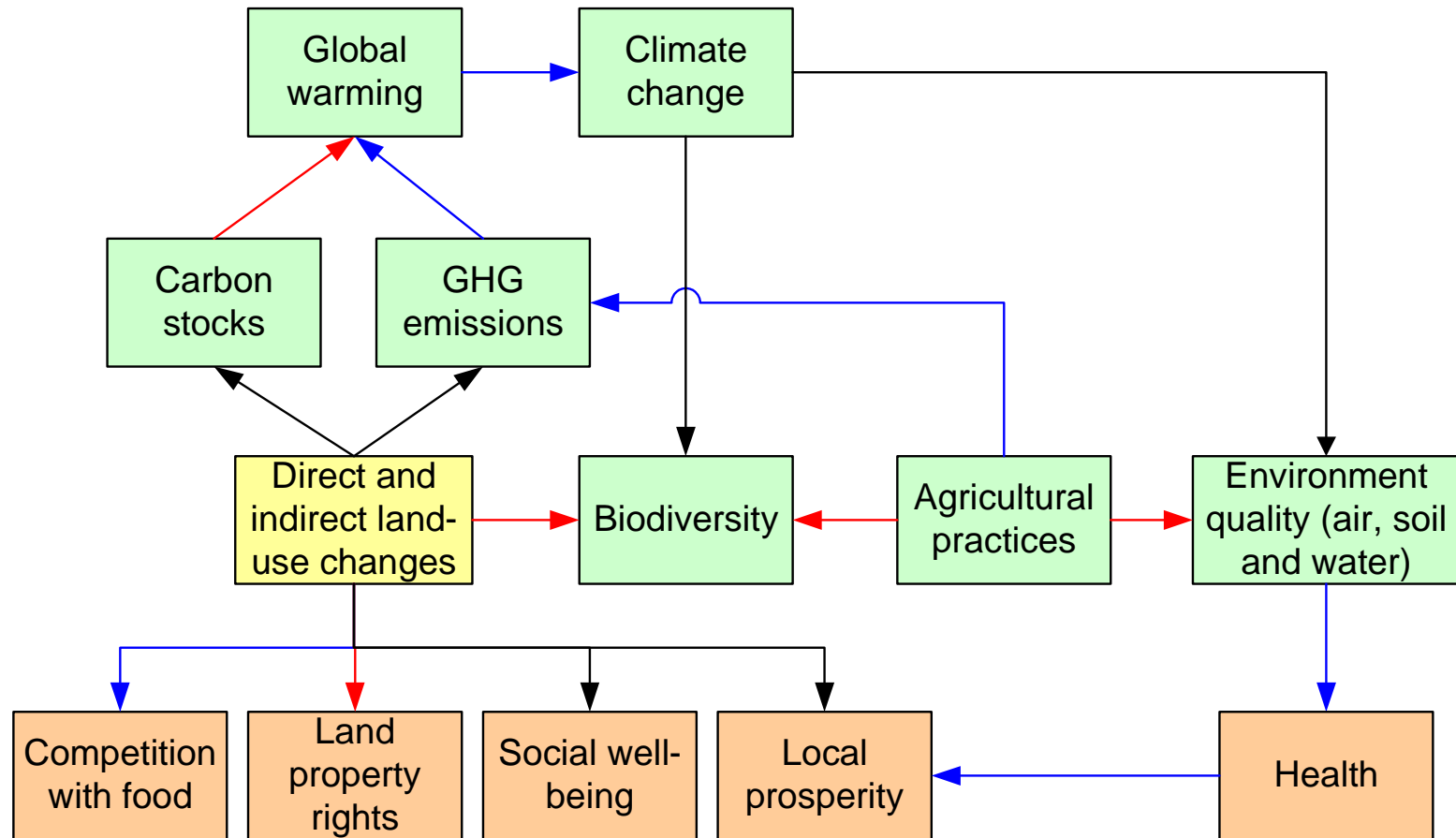
Part 2

- **Qualitative model**
- Articulation of externalities or sustainability criteria to identify cause-effect relationships, feedback, induced and non-linear effects

With A having an impact on B:



Part 2



Part 2

- Externalities or sustainability criteria cannot be considered in isolation, they are parts of a **system**, with limits:
 - **Agricultural practices** vary a lot from one region to another,
 - **Indirect effects** are far from being understood and assessed correctly,
 - **Long-term effects** of climate change are still unknown, etc.
- The model was iteratively **refined** through :
 - Interactions with experts in **workshops**,
 - Interactions with experts in **brainstorming sessions**,
 - New **scientific releases** review, as many research efforts are still ongoing on many of parameters (climate change, biodiversity, indirect effects, etc).



Consolidated version

Part 2

- **Quantitative model**
- On the basis of the qualitative model
- Monetization of externalities
- Qualitative assessment of other sustainability criteria
- For each energy route, a table will gather quantitative (incl. monetization) and qualitative evaluation of sustainability criteria
- Comparisons of energy tables will enhance the policy makers' choice of the best bioenergy route(s) to support



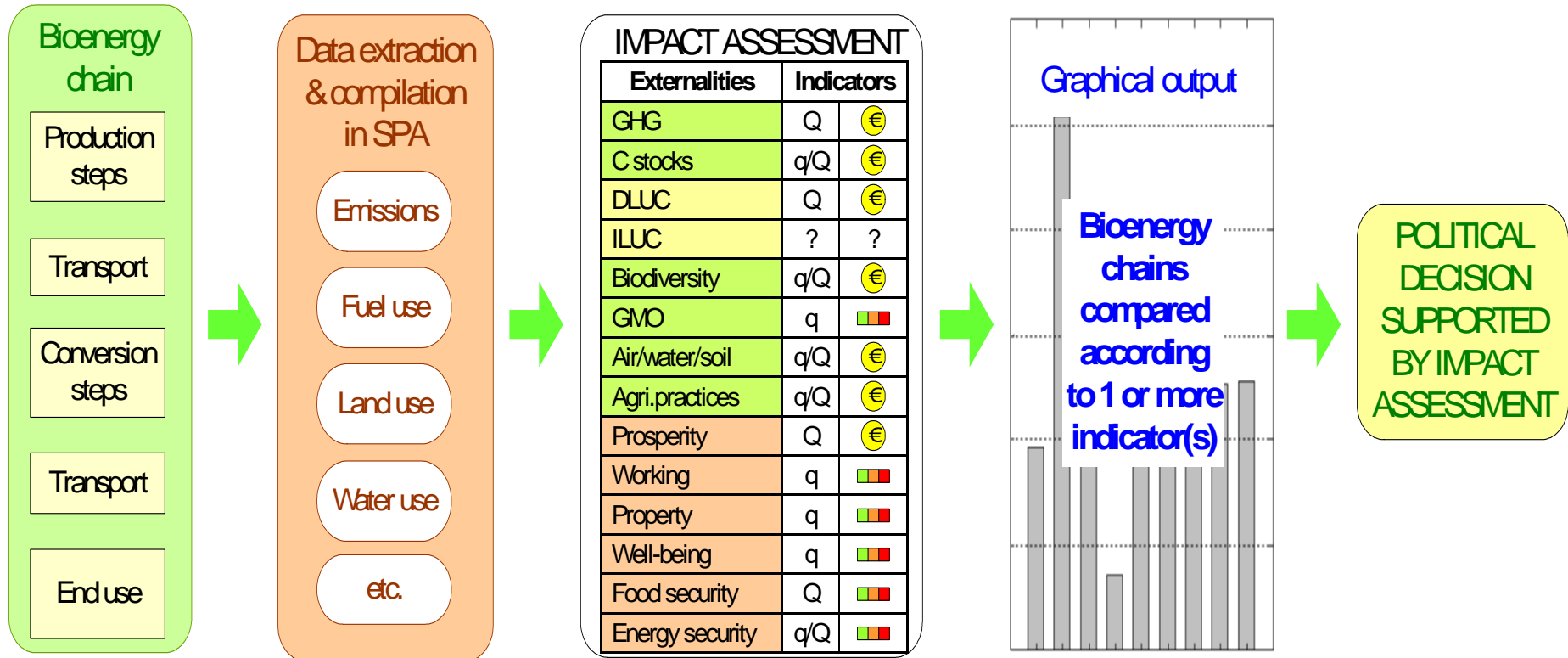
Part 2

Production	Resource	Conversion technology	
<i>High importance</i>			
Belgium	Rapeseed	(Pure plant oil)	Biodiesel
Belgium	Wheat	Ethanol	ETBE
Belgium	Sugar beet	Ethanol	ETBE
Belgium or import	Wood pellets	100% biomass power plant	
		Co-firing in coal power plant	
		CHP	
Belgium or import	Wood chips	Co-firing in coal power plant	
		CHP	
Belgium or import	Wood dust	Co-firing in coal power plant	
		CHP	
Belgium	Landfill gas	Biogas	Power/CHP
Belgium	Sewage sludge	Biogas	Power/CHP
Belgium	Manure	Biogas	Power/CHP
Belgium	Biogenic fraction of MSW	Biogas	Power/CHP

Part 2

Medium importance			
Belgium	Maize	Ethanol	ETBE
		Biogas	Power/CHP or biofuel
Import	Soybean	(Pure plant oil)	Biodiesel
Import	Palm oil	(Pure plant oil)	Biodiesel
Import	Sunflower	(Pure plant oil)	Biodiesel
Import	Sugarcane	Ethanol	ETBE
Import	Jatropha oil	(Pure plant oil)	Biodiesel
Belgium	Tallow	Biodiesel	
Belgium	Used cooking oils & fats	Biodiesel	
Belgium	Agrofood residues	Co-firing in coal power plant	
Belgium or import	Glycerine	Methanol	
Lower importance			
Belgium	Miscanthus, SRC, Switch grass	Lignocellulosic ethanol	
Belgium	Woody & non-woody biomass	Gasification	Methanol
			Fischer-Tropsch
			DME

Part 2



Part 3

- **Firms' sustainable choice of energy**
- **TEXBIAG** also expects to enhance the capacity of small, medium and large firms from energy and agricultural sector in implementing bioenergy projects.
- Identification and evaluation of the **benefits** from bioenergy projects implementation = sustainability criteria.
- Do bioenergy projects attain any environmental (GHG emissions reduction, biodiversity conservation...) and/or socio-economic (employment creation, rural development...) targets?



Part 3

- Fighting against global warming and climate change is part of sustainable development and imposes the mitigation of **GHG** emissions which are, in large part, due to energy production and use.
- This is also important for firms to develop energy buying strategy as energy represents 10 to 50 % of their **operating costs**.
- Several **possibilities** to “green” energy consumption which can be **mixed**:
 - **Optimizing** energy use,
 - **Buying** green/sustainable energy from suppliers,
 - **Producing** green/sustainable energy on their own or in collaboration with suppliers,
 - **Investing** in external and sustainable projects with partners.



Part 3

- Moreover, in the future, firms will get more and more freedom to choose their “energy-mix” thanks to the **decentralization** of production (photovoltaic panels, windmills, heat-pumps, CHPs...) and the connection to **smart-grids**.
- There is thus a possibility for firms to **strategically manage**, in **real-time**, their energy **consumption** but also their energy **production**.
- We want to assess **how** firms, whatever their **sector** (energy, agriculture or other), can take into account our list of **sustainability criteria** in their **energetic choice**: agricultural bioenergy, but also other bioenergies, other renewable energies, energy efficiency, etc.



Part 3

- For each **sustainability criterion** selected in part 2, we intend to study:
 - **If** firms can measure it (Is this criterion relevant for firms? Is there any available data on it?),
 - **How** firms can measure it in order to make the most sustainable energetic choice (Which indicators and methods are used to define goals/targets and assess performance?).
- In addition, we hope to identify which criteria **influence** the most firms' sustainable energy strategy.
- Other **initiatives** and standards: GRI, ISO1400X, EMAS, UWE...
- Qualitative **methodology**: case-studies on a panel of firms, supported by interviews, observations and sustainable development reports readings.



Conclusion

- An overview of the definition and the application of sustainability criteria in the particular context of energy
- An identification of the criteria which influence the most firms' sustainable energy choice



Thank you for your attention !

Questions ?
Comments ?

Isabelle Brose
Louvain School of Management –University of
Namur
Rempart de la Vierge, 8
5000 Namur, Belgium
isabelle.brose@fundp.ac.be