GHG methodologies for biofuels : French developments

2nd GBEP Task Force meeting on GHG methodologies
Washington D.C.,6-7 March 2008
UN Foundation

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The French context

- **Biofuels an historical initiative for security of supply and agriculture policy support with reference to GHG issues in the "Plan Climat" (2004)**
- **New objectives in relation with European initiatives (2005)**
  - **5.75% up to 7% in 2010**
  - **Fiscal incentives mechanism**
  - **A need to review the GHG impact of biofuels (2002 Ademe-Direm study) with the Ademe/IFP seminar on 1st March 2007**
  - **Decision of launching a new study to explore the Methodology issues and define the most as possible efficient recommendations**
- **The "Grenelle de l'environnement" initiative**
  - **working group with various stakeholders (2007)**
  - **Operational committee by thematic to propose actions to the government: one on the Renewables and specially on biofuels (certification, economic and fiscal issues...) on work.**
  - **Measures to be adopted in 2008 (Laws and regulations)**

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GHG methodology development

- **Seminar IFP/ADEME in March 2007**
  - **state of the art of the thematic**
  - **an international review: JRC, LBST,IFEU, Ecofys, M.Wang for USA**

- **New French study (kick-off 1st october 2007 and final results expected mid March 2008)**
  - **1st generation in France**
  - **Energy, GHG and other atmospheric pollutants**
  - **Allocation procedure recommandations**
  - **identification of key data issues**

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Structure and content

- **TITLE:**
  - **"ETUDE SUR LA METHODOLOGIE à appliquer pour établir le REFERENTIEL DES BILANS d'énergie, de gaz à effet de serre et des polluants atmosphériques locaux des BIOCARBURANTS DE 1ERE GENERATION en France"**

- **Organisation**
  - **financing : ADEME, Agriculture, Environment and Energy Ministeries, IFP**
  - **Selection of a consultant (Bio Intelligence Services)**
  - **two committees :**
    - **steering committee with the financing**
    - **technical committe to support data and pathways specificities :**
      - members of ST
      - Technical and scientific institutes : INRA, Arvalis, CETIOM, ITB, ITERG,
      - Industry : Total, Renault, PSA Peugeot-Citroën, Saipol-Diester-Industrie, Téréos, Cristal-Union, Véolia,
      - NGO: Réseau Action Climat

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Méthodologie
Référentiel Biocarburants
Conclusions de l'étude

- Infrastructures and material issues
- N_2O emissions
- Change of Land use
- Allocation: massic, energy content, economic, avoided impact

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pathways list

- ethanol: corn, wheat and sugar beet including ETBE
- esters (methylic and ethylic) of RS and SF
- esters methylic of animal greases
- direct RS or SF vegetable oils
- ethanol from sugar cane:imports
- esters of palm and soybean oil : imports
- gasoline SP95
- diesel fuel

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Emission factors for N_2O

- Ampleur de la problématique
  - PRG du N_2O: **296 kg éq. CO_2 par kg de N_2O émis.**
  - Facteur d'émissions directes : **1% [IPCC 2006]**
  - Facteur d'émissions indirectes : **0,1% (volatilisation) et 0,23% (lessivage) [IPCC 2006]**

	Contribution du N_2O au bilan total	Contribution du N_2O à l'étape agricole
Ethanol de blé	**21%**	**33%**
Ethanol de maïs	**17%**	**27%**
EMHV de colza	**28%**	**36%**
EMHV de tournesol	**15%**	**25%**
EMHV de soja	**3%**	**6%**
HVP de colza	**35%**	**36%**

Calculs BIO IS – only direct emissions

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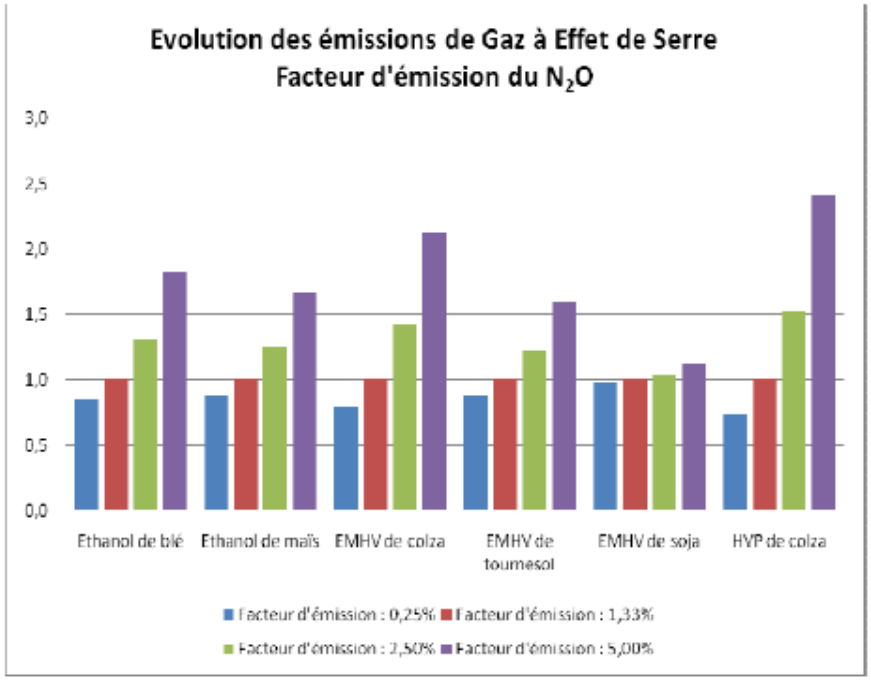
Emission factors for N_2O

A strong influence



No real consensus on the model due to regional influences

Modèle	Consensus Scientifique	Périmètre d'applicabilité
IPCC	++ Consensus par défaut	+ Transversal
DNDC	+ Moindre niveau de validation que l'IPCC	+ Contexte européen
SKIBA	- Mesures expérimentales locales	- Contexte Anglais
Crutzen	-- Remises en cause fortes, publication récente	+ Transversal

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Emission factors for N_2O

- **Recommendations** :
  - direct emissions **, on the basis of** IPCC factor **: 1%.**
  - indirect emissions **, on the basis of** IPCC factor **: 0,1% (volatilization) & 0,225% ("*lessivage*").**
  - develop INRA works to evaluate "local" factor distribution in a longer term.

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Change of land use

- **A priori two distinct problems but...**
  - **direct change :** conversion of a land whatever the initial use towards a culture allowing biofuel production
  - **indirect change :** competition between different crops and forest...
  - Within EU should be limited to crop rotation issues

- **Modelisation of CLU :** IPCC 2006, Volume 4
  - Stocks **in the vegetation** (above/under the ground)
  - stocks in the soil

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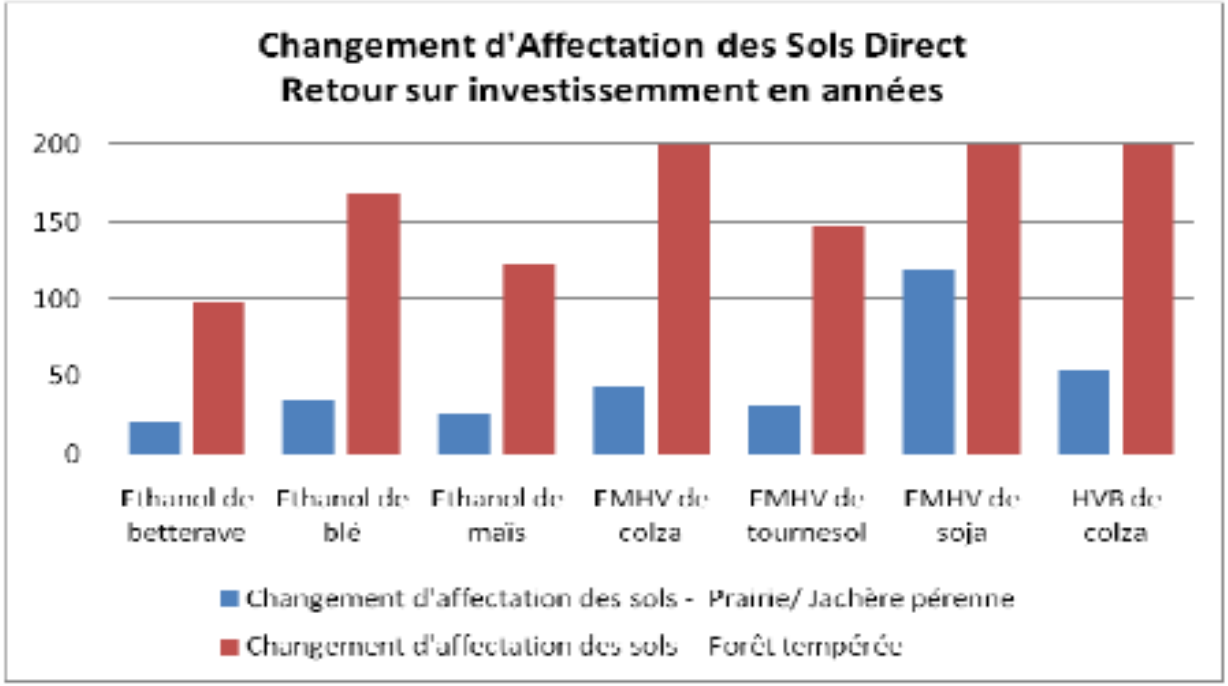
Change of land use

A strong influence: could more than cancel the biofuel benefits



A real difficulty to have a average scenario by crop and/or region and no efficient way to measure indirect CLU (local versus global)

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Change of land use

Recommendations

- **Regional CLU differencies**

Geographical area	Direct change	Indirect change
Europe	Null or marginal impact	Unknown with uncertainties
Africa	Unknown with uncertainties	Unknown with uncertainties
North America	Unknown with uncertainties (to be clearly defined)	Unknown with uncertainties
South America	Unknown with uncertainties	Unknown with uncertainties
Asia	Unknown with uncertainties	Unknown with uncertainties

- **Review systematically results under the perspectives of a scenario of CLU:** develop a regional and worldwide scenario of potential pressure due to biofuel development on the "available" land (forest...), including food production development .

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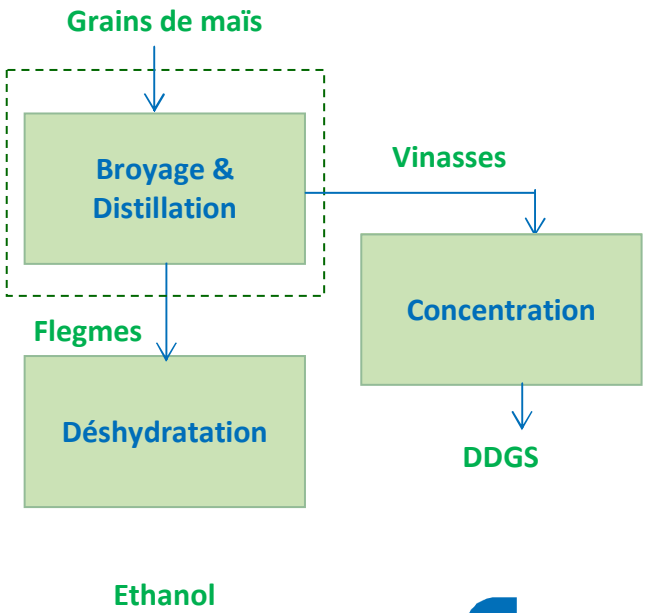
Allocations in case of co-products

- **Methodology issue**
  - **precise definition of the system**
  - **Base of the allocation :**
    - massic
    - valorized massic
    - economic value
    - energy content

- **Massic « strict »**
  - Vinasses : 90%
  - Flegmes : 10%
- **Massic « corrected»**
  - Vinasses (DDGS ms): 44%
  - Flegmes : 56%

exemple



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Allocations : avoided impact allocation

- **Methodology issues**
  - **Choice of the valorization mode** of the co-product
  - **Choice of the product to be substituted**,
  - **Choice of the criteria for defining** the ratio of substitution between the two products (example : protein content, digestive content , dry mass, …)

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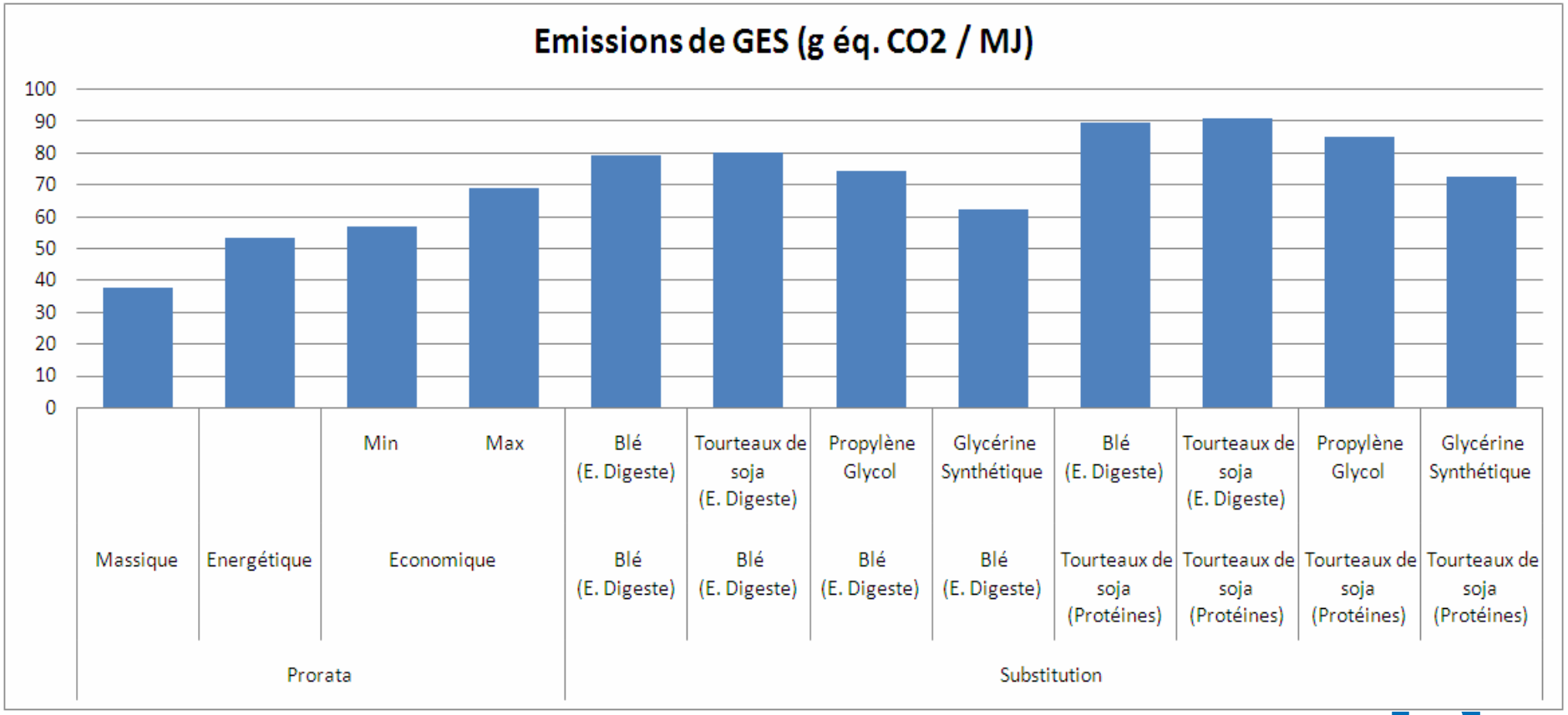
Allocations : simulation

- example of results : Rapeseed methylic ester



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Allocations :

- **Recommendations:**
  - **Base: avoided impact when process clearly identified**
  - Energy content allocation for other cases **as it limits the risks of over-allocation of impacts to the co-products compared with massic allocation**

Classe	Méthode recommandées	Précaution
SPREADING	Substitution	NPK Flow Balance
ANIMAL FOOD	Prorata énergétique	Faire une analyse de la réalité physique du process en amont
INDUSTRY		
ENERGY	substitution	Mix énergétique si export d'électricité

Still under discussion as the heat/power substituted could be difficult to defined

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Reference value :

- **Recommendation and points of discussion:**
  - problems of the infrastructure: on a comparative objective, verify the potential impact (5% threshold) and require to recover oil sector evaluation and update the agriculture part
  - the allocation issue is an other difficulty for refining system in order to differentiate gasoline and diesel fuel. Various options with no consensus:
    - incremental calculation of JRC study
    - Marginal content from linear model
    - Allocation (massic/energy content, economic)
    - Common value for both fuels on global energy content allocation

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