EN/05

TEXBIAG - Results

Decision-making tools to support the development of bioenergy in agriculture

DURATION OF THE PROJECT
15/12/2006 - 28/02/2011

BUDGET
767.473€

KEYWORDS
Bioenergy, biomass, agriculture, sustainable development, decision-making tools, externalities, environmental impacts, socio-economic impacts, policy prediction.

CONTEXT

Bioenergy from agriculture is today at the heart of sustainable development, integrating its key components: environment and climate change, energy economics and energy supply, agriculture, rural and social development.
Fighting against climate change imposes the mitigation of greenhouse gases in our atmosphere. Considerable efforts have to be pursued, especially in the field of energy production and use.
Concerning energy supply, the limitation of fossil fuels import is a crucial matter: beside the rational use of energy, the contribution of renewable sources, including biomass, for energy production is of considerable importance. It is worth to note that, in addition to the limitation of fossil fuels import, implementing renewable energy sources offers other attractive economic advantages, such as jobs creation, technology development, technology export, etc.

Sustainable agriculture leads to important questions about the diversification of agricultural productions and sources of incomes for farmers, the use of rural and arable lands for food and non-food crops, the contribution of agriculture to climate change fighting and renewable energy supply.
The lack of primary and reliable data on bioenergy externalities from agriculture and the lack of decision-making tools are important non-technological barriers to the development of bioenergy from agriculture on a large scale, and, consequently, to the achievement of the national and regional objectives of sustainable development in greenhouse gases mitigation, secure and diversified energy supply, rural development and employment and agriculture future. Furthermore, the recent worldwide controversies about transport biofuels, food shortages and increasing prices have demonstrated the need for sustainability criteria applied to biofuels and bioenergy.

OBJECTIVES

In this sustainable development context, the objective of the TEXBIAG project is to lead to an actual and significant contribution of bioenergy from agriculture to the mitigation of greenhouse gases emission, to a secure and diversified energy supply, to farmers' incomes and rural development.

To reach this final objective, it is necessary to grasp the modifications that will affect land-use on the one hand, and the energy utilizations and conversions of biomass on the other hand. To support this, it is also imperative to develop a comprehensive and reliable knowledge of the environmental and socio-economic impacts (externalities) of bioenergy from agriculture, which condition its long term development.

To achieve this goal, the TEXBIAG project provides three tools:

1. A database of primary quantitative data related to environmental and socio-economic impacts of bioenergy from agriculture integrating biomass logistics;
2. A mathematical model monetizing bioenergy externalities from agriculture;
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, and environment).

CONCLUSIONS

Considering priority chains and available sources and experts for data collection, data adaptation focused on the 4 four main energy crops for biofuels production in Belgium:

- Maize (grain maize in Flanders, silage maize in Wallonia);
- Wheat;
- Rapeseed;
- Sugar beet.

Different scenarios have been considered for each crop, according to farm size, soil characteristics and/or fertilizers application.
Detailed results and calculations are available in Deliverable D1 – Database of environmental and socio-economic impacts of bioenergy from agriculture.

Applying qualitative and/or quantitative indicators and monetization possibilities to cultivation pathways enables producing comparisons between studied biomasses.
The following impacts are included in the externalities assessment model:

- Quantification of GHG emissions for the cultivation step
- Qualitative impact on water quality
- Quantification of acidification and eutrophication potentials
- Qualitative impact on soil quality
- Impact of deposition of pollutants on biodiversity
- Job creation relating to cultivation
- Qualitative assessment of socio-economic impacts
- Monetization of impacts

SSD SCIENCE FOR A SUSTAINABLE DEVELOPMENT

ENERGY

TEXBIAG - Results

Decision-making tools to support the development of bioenergy in agriculture

The externalities assessment model underlines the sensitivity of results towards cultivation pathways and the choice between work processes options.
The main conclusion drawn from these figures and calculations is that even if default values exist for bioenergy production routes and are commonly accepted, it should remain possible to propose data adapted to the local context.
The database and models developed by this project can be of great support to this process, allowing the user, whether a decision-maker or a producer, to compare options between several bioenergy routes and their cultivation pathways.

CONTRIBUTION OF THE PROJECT TO A SUSTAINABLE DEVELOPMENT POLICY

TEXBIAG must be seen as a contribution to the impact assessment of bioenergy in general, with focus on the cultivation step, which is one of the biggest, if not the biggest, contributing step to the overall impact of a given bioenergy chain. Impact criteria are under continuous development at national and European levels to allow producers bioenergy to demonstrate to potential consumers the quality of their products (through the observance of standards) along the process-chain. TEXBIAG contributes to a clear and harmonized methodology at European scale, regarding emissions assessment all along the fuels life cycle, as well as the verification of these emissions at the suppliers' side.

Among the three tools developed by TEXBIAG the database of environmental and socio-economic impacts gathers a considerable amount of data adapted to the local context. Focussing on the cultivation step, several crop management scenarios were selected matching realistic situations according to farm size, soil characteristics and fertilisation preferences.

The externalities assessment model assembles quantitative, qualitative and monetization results for the cultivation step of considered routes. It enables the comparison of these routes according to an extended set of sustainability criteria and allows the user to decide whether a category of impact weighs more than another in a particular situation.

The policy prediction tool (SPA2) finally is made available, and allows the following:

- To define an arbitrary 'system' by assembling streams and components (e.g. Belgium)
- To study the substitution of components within the considered system
- To feed in data from arbitrary sources, with or without data modifications, and in combination with local data
- To determine the impacts of any substitution, with any assumption about impact methodology

Additional specific advantages of SPA2 are:

- Flexibility in mixing different types of data sources
- Unlimited streams going in and out of process units
- No allocation assumptions needed inside the system

The impact balances must allow policy makers to take decisions, and the combined tool allows to assess/compare the decisions taken by them.

CONTACT INFORMATION

Coordinators

Yves Schenkel (& Florence Van Stappen)
Centre wallon de Recherches agronomiques (CRA-W)
Département Génie rural – DGR
Chaussée de Namur, 146
B-5030 Gembloux
Tel : +32 (0)81 627 148 or 081 627 185
Fax : +32 (0)81 615 847
schenkel@cra.wallonie.be
(vanstappen@cra.wallonie.be)
www.cra.wallonie.be

Promoters

Jacques Deruyck, (Svend Bram & Thomas Neven)
Vrije Universiteit Brussel (VUB)
Pleinlaan, 2
B-1050 Brussel
Tel : 02 629 2393
Fax : 02 629 2865
jdruyck@vub.ac.be

Annick Castiaux (& Isabelle Brose)
Facultés Universitaires Notre Dame de la Paix (FUNDP)
Business Administration Department
Rempart de la Vierge, 8
B-5000 Namur
Tel :+32 (0)8172 48 80 or (0)8172 53 15
Fax +32 (0)8172 48 40
annick.castiaux@fundp.ac.be
(isabelle.brose@fundp.ac.be)
www.fundp.ac.be

Johan Driesen
Katholieke Universiteit Leuven (K.U.Leuven)
Department Electrical Engineering
Research group Electrical Energy
ESAT-ELECTA
Kasteelpark Arenberg 10
B-3001 Heverlee - Belgium
Tel: +32 (0)16 32.10.20 or (0)16 32.10.24
Fax: +32 (0)16 32.19.85
johan.driesen@esat.kuleuven.be
http://www.esat.kuleuven.be/electa

SSD SCIENCE FOR A SUSTAINABLE DEVELOPMENT

BELGIAN SCIENCE POLICY
Louizalaan 231 Avenue Louise • B-1050 Bruxelles
Tél. +32 (0)2 238 34 11 • Fax +32 (0)2 230 59 12 • www.belspo.be/ssd
Contact. Igor Struyf

ENERGY