IS BIOETHANOL SUSTAINABLE? A LIFE CYCLE ASSESSMENT VIEWPOINT

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[avniR] 2012 LCA Conference

Lille, November, 06 2012

I. INTRODUCTION

▪ Bioethanol is considered a form of renewable energy that can be produced from agricultural feedstocks.

The popularity of fuel bioethanol has increased

▪ Bioethanol seems to be a solution to overcome the world energy crisis and the environmental problems.

▪ This view is extremely simplistic and does not take into account the various difficulties concerning the production, storage, distribution and use of bioethanol.

(1) Is bioethanol really sustainable?

(2) What are the eco-friendly alternatives to produce bioethanol?

LCA methodology can answers to these questions since it considers all environmental burdens associated with each sub-process involved in bioethanol production.

MAIN RESEARCH TASKS:

(1) Evaluation of the environmental impacts of wheat grain-based-bioethanol (WGBE).

(2) Demonstration the unsustainability of a product frequently labelled by bio/renewable/clean: bioethanol.

II. METHODOLOGY

II.1. Goal and scope definition

II.1.1. Goal and scope

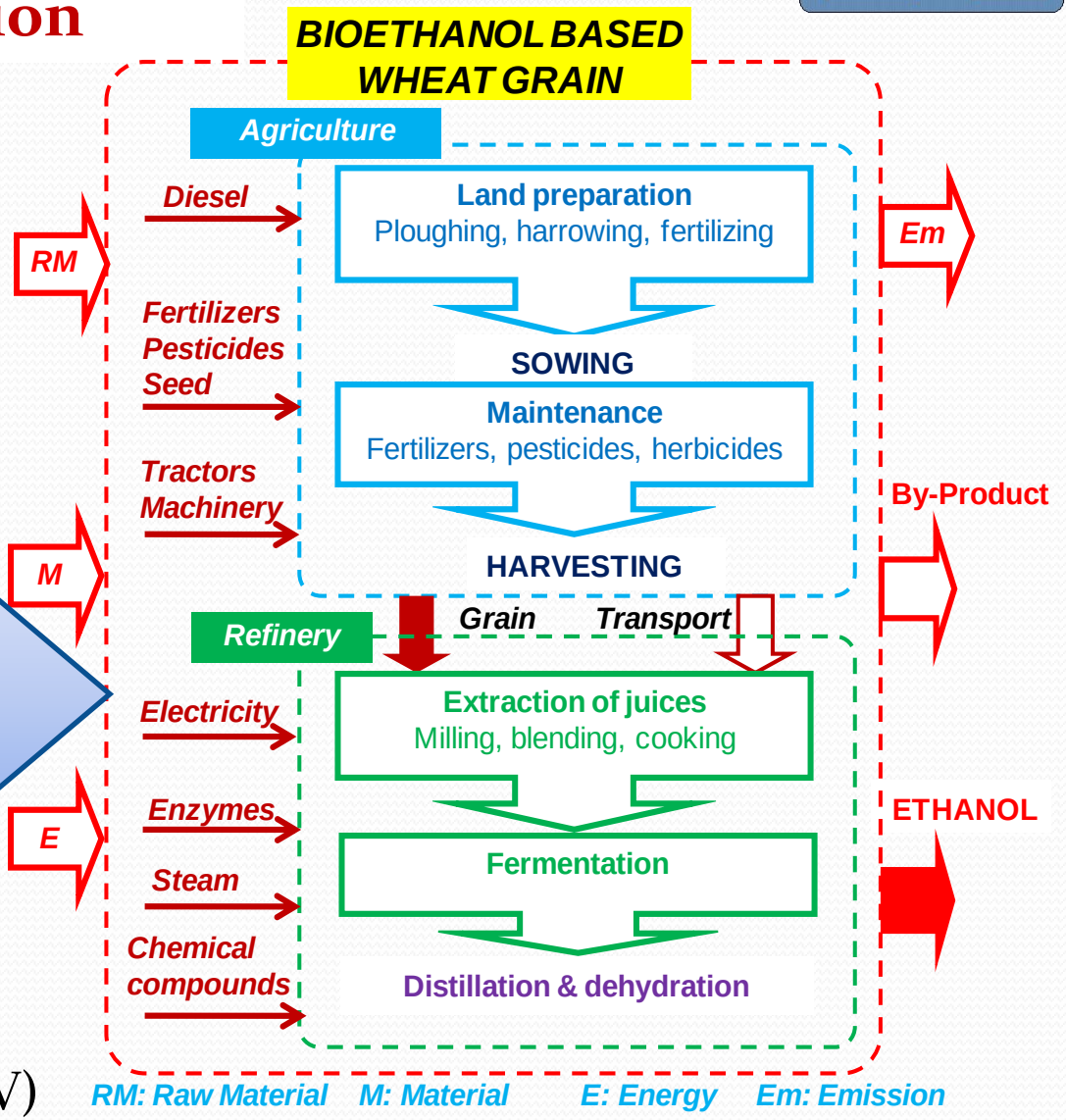
Evaluation of the environment impacts of WGBE

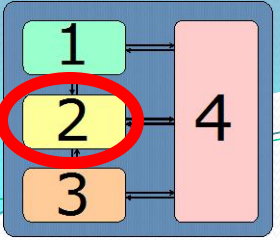
II.1.2. System boundaries

The WG is primarily cultivated for the production of Eth, the energy needed and the environmental impact of cultivation and harvesting were included in the analysis.

II.1.3. Functional unit

1MJ of fuel energy content, measured in terms of the (LHV)





II.2. Life cycle inventory

Materials and energy used and waste generated in producing **1 MJ** of bioethanol

II.3. Life cycle impact assessment LCIA

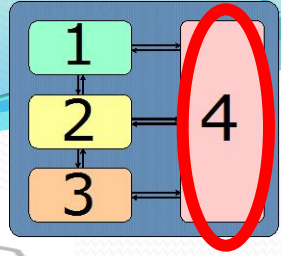
CML baseline 2000 is used as life cycle impact assessment method.

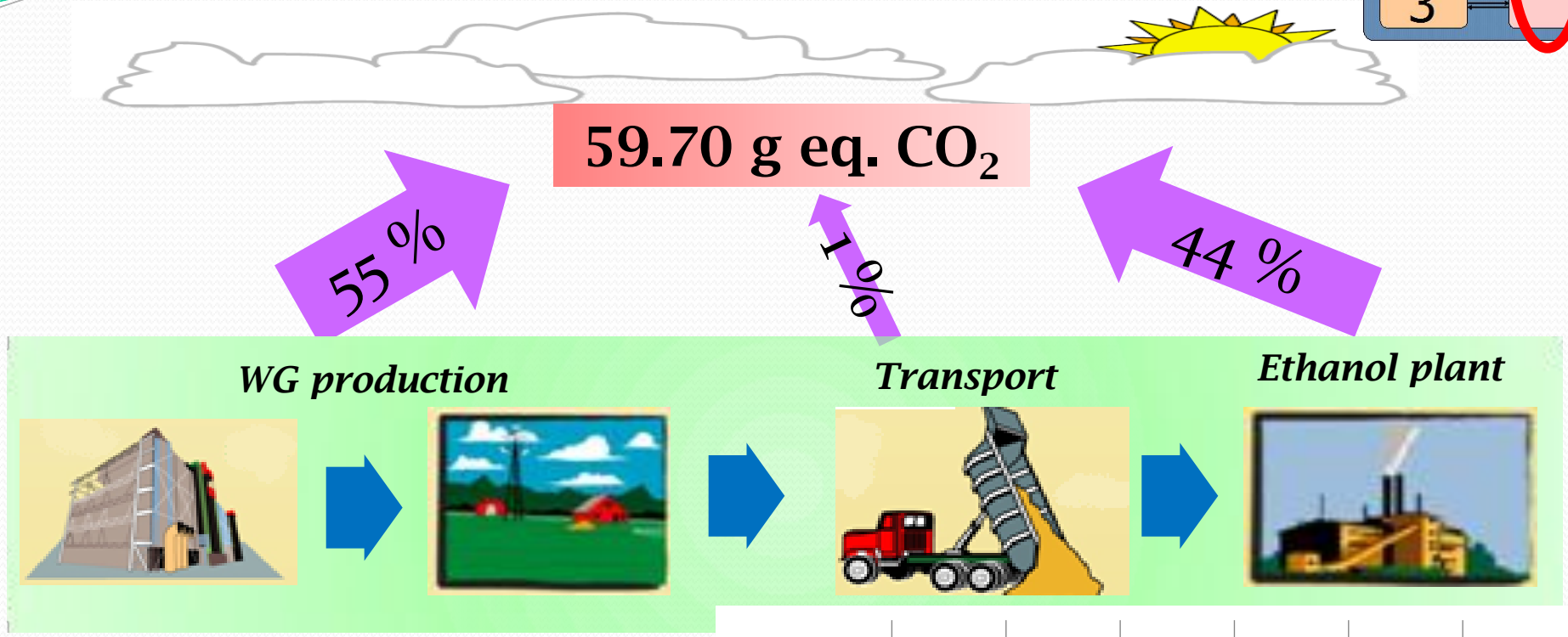
	Resources
Water, unspecified natural origin	*0.37 kg*
	Materials / fuels
Wheat grains IP, at farm/CH S[a]	*0.12 kg*
➔Transport, lorry 40t B250[a]	*5.94 kg.km*
Fertilizer, as (N)	*3.37 g*
Fertilizer, as (P)	*0.36 g*
Fertilizer, as (K)	*1.07 g*
➔Transport, lorry 28t B250[a]	*0.24 kg.km*
Sulfuric acid B250[a]	*1.09 g*
Sodium hydroxide, 50% in H_2O B250[a]	*1.65 g*
➔ Delivery Van <3.5t B250[a]	*0.14 kg.km*
	Electricity/heat
Electricity France B250[a]	*0.06 MJ*
Heat, Gas B250[a]	*0.3 MJ*
	Avoided products
Protein peas IP, at feed mill B250[a]	*0.04 kg*
	Emissions to air
CO_2, biogenic	*36.23 g*
	Emissions to water
Waste water	*0.37 litre*

[a]: BUWAL 250 SimaPro

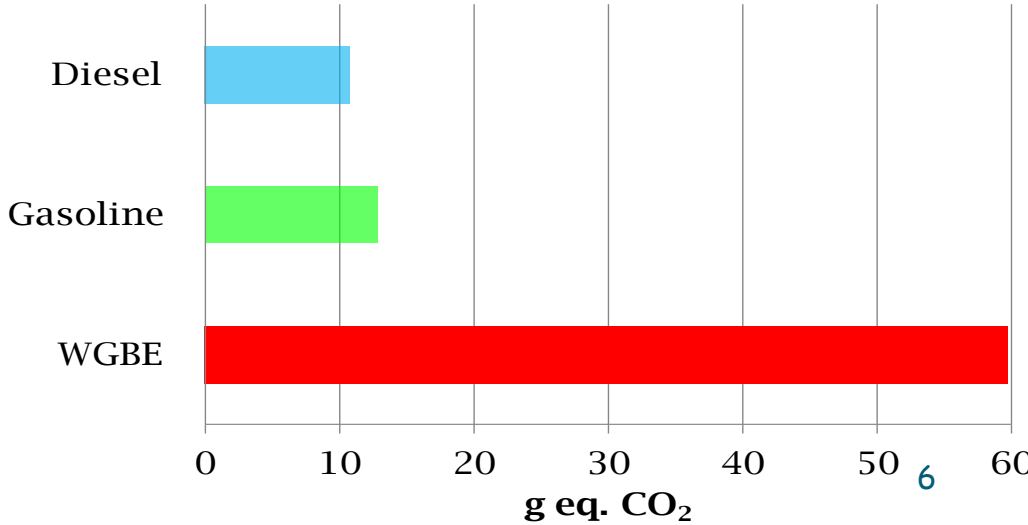
II.4 Life cycle result interpretation

2.4.1. Global warming potential (GWP)





Compared GHG emission of WGBE with the GHG of fossil fuels production (including crude oil extraction, transport and petroleum refinery).

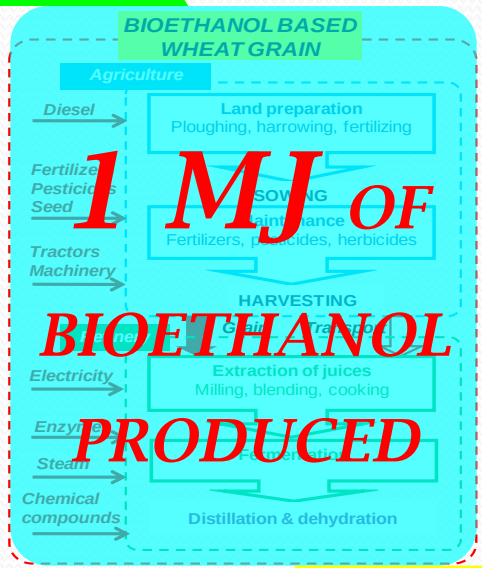


2.4.2. Eutrophication potential (EP)

The overall contribution to the EP impact of WGBE system is

0.46 g PO4 eq..

~97% is attributed to the wheat grain production step.



2.4.3. Acidification potential (AP)

About **0.34 g SO2 eq.**

This high impact is a consequence of the extensive use of ammonia as a fertilizer in wheat grain production.

III. CONCLUSION

- ***Are biofuels better for the environment than fossil fuels?*** We are not sure, but this is certainly not the cheapest way to reduce green house gas emissions.

- ***Is BIOethanol is really BIO?*** No, labels sustainable and bio that often affect bioethanol should be considered with vigilance, only LCA approach can measure the eco-friendly degree of such product.

- ***Can biofuels make us energy independent?*** No. The best we can hope for is less dependence of foreign oil.

- ***Who is benefiting from the (politically attractive) billions of dollars currently subsidizing biofuels?*** You be the judge of that !

THANK YOU FOR YOUR ATTENTION!

Acknowledgements:

The authors wish to thank Gabes Industrial & Technological Pole for support.

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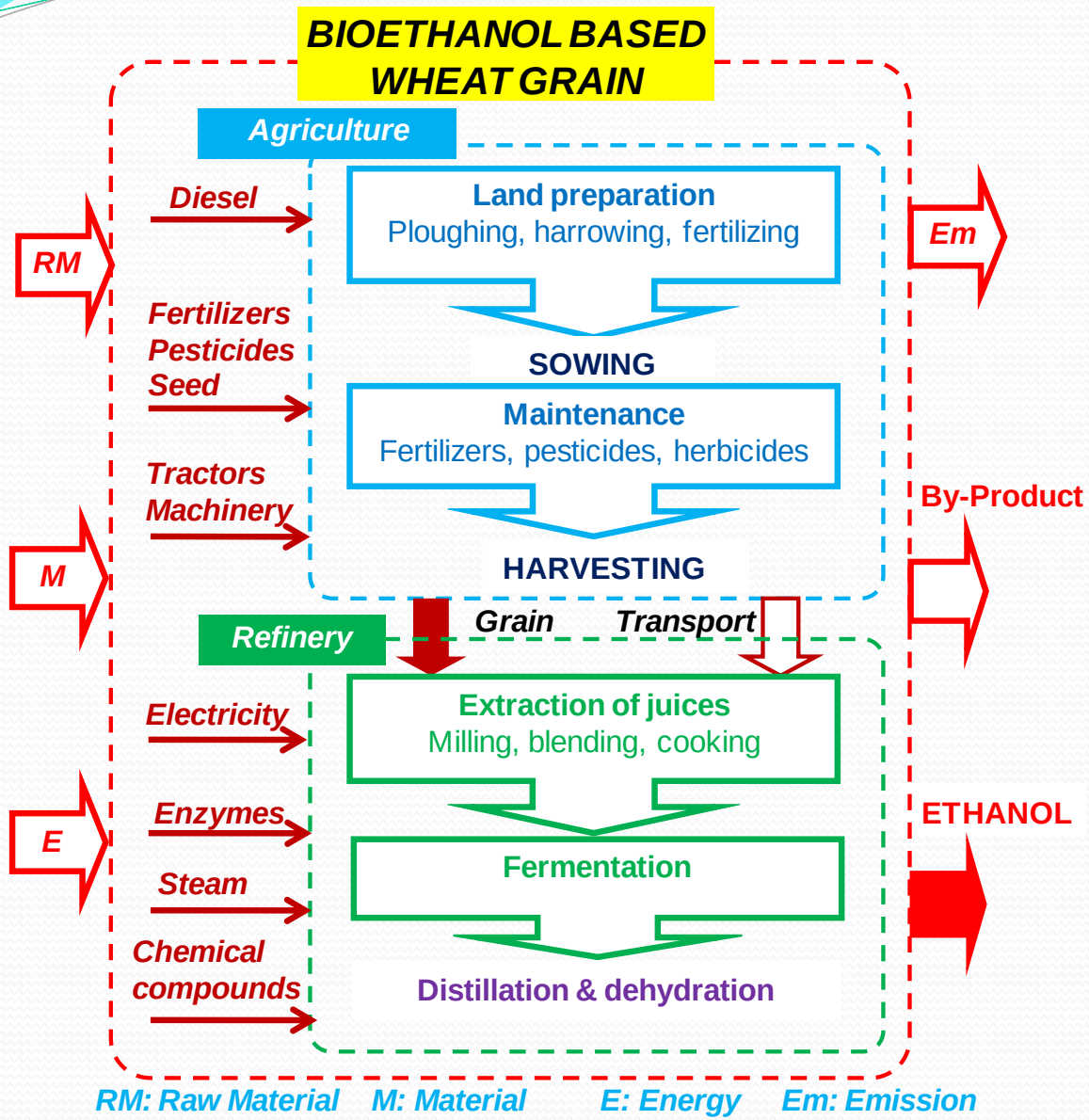
BIOETHANOL BASED WHEAT GRAIN
Agriculture
Diesel
RM
Fertilizers
Pesticides
Seed
Tractors
Machinery
M
Land preparation
Ploughing, harrowing, fertilizing
SOWING
Maintenance
Fertilizers, pesticides, herbicides
HARVESTING
Em
By-Product
Refinery
Grain
Transport
Electricity
Enzymes
E
Steam
Chemical compounds
Extraction of juices
Milling, blending, cooking
Fermentation
Distillation & dehydration
ETHANOL
RM: Raw Material
M: Material
E: Energy
Em: Emission

World ethanol production for transport fuel tripled between 2000 and 2007 from 17 billion to more than 52 billion litres.

Are they more environmentally friendly than the fossil fuels they will replace?