GR3
GRASS
TO GREEN GAS

Results & Conclusions

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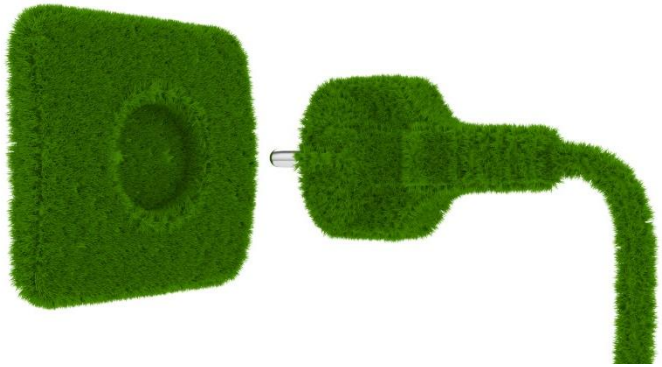
What?



From **Grass** to **Energy**

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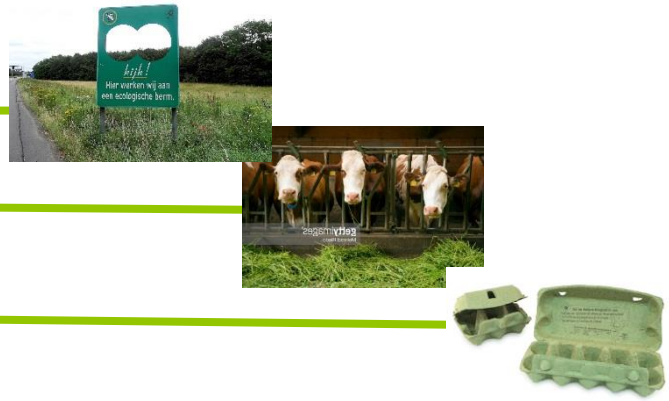


GR3 GRASS TO GREEN GAS

"available" grass that can not be valorised in "higher" application

Why?

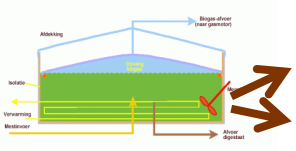
SUPPLY

Ecologic mowing

Purification

Ensilaging

Digestion



CHP

Biomethane fuel

Composting

MISSING VALORISATION CHAIN

VALORISATION

± 800 000 tons of grass (waste) generated

Actually 70% disposed, 30% composted

Due to :

- Missing logistics
  Investments required on both sides
- Legislative framework
- No contact between stakeholders

Possibilities

- Increased renewable energy production
  1 ton grass ~ 340 kWel and 400 kWth
- Primary energy savings (in composting)
- Less uncontrolled grass disposal
- Jobcreation (social economy)

Biogas plants looking for more sustainable feedstock

Where?

How?

Collection of information

Where is the grass available?

- Reliable data
- As detailed as possible

Which **Technologies** should be used?

- Proven technologies (no research)

What would the impact be?

- Environmental
- Economic
- Social

What about the **policy** and legal issues?

- Incentives
- Restrictions
- Suggestions

Dissemination

Business plan development

- Real cases
- Based on the information collected
- Both first screening and detailed advice

Grass Inventory

Strategy

1 – Define potential stakeholders
2 – Contacting stakeholders
3 – Collecting data

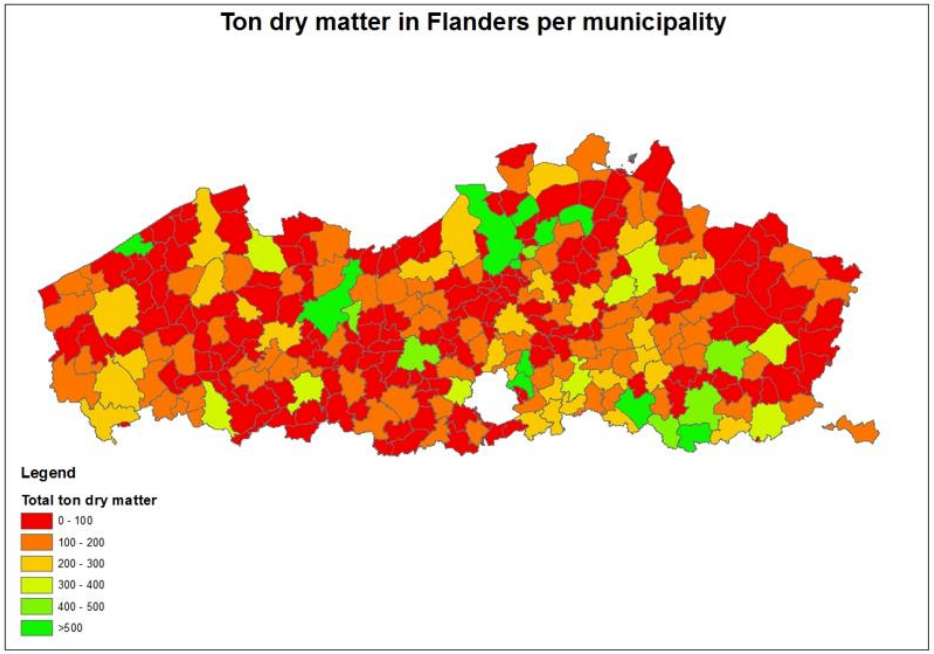
Guidelines on data collection

4 – Scale down of data (municipality level)
5 – Quality assesment

Grass Inventory

Results - Flanders

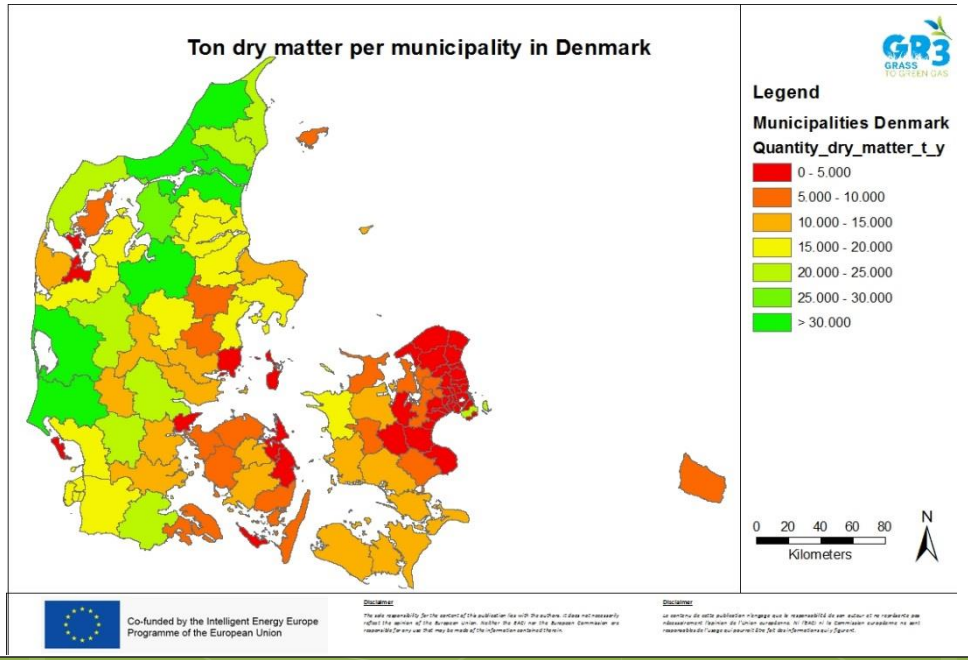
Origin	- Roadside management - Landscape management
DM	27%
Total	60 000 tonDM/yr



Grass Inventory

Results - Denmark

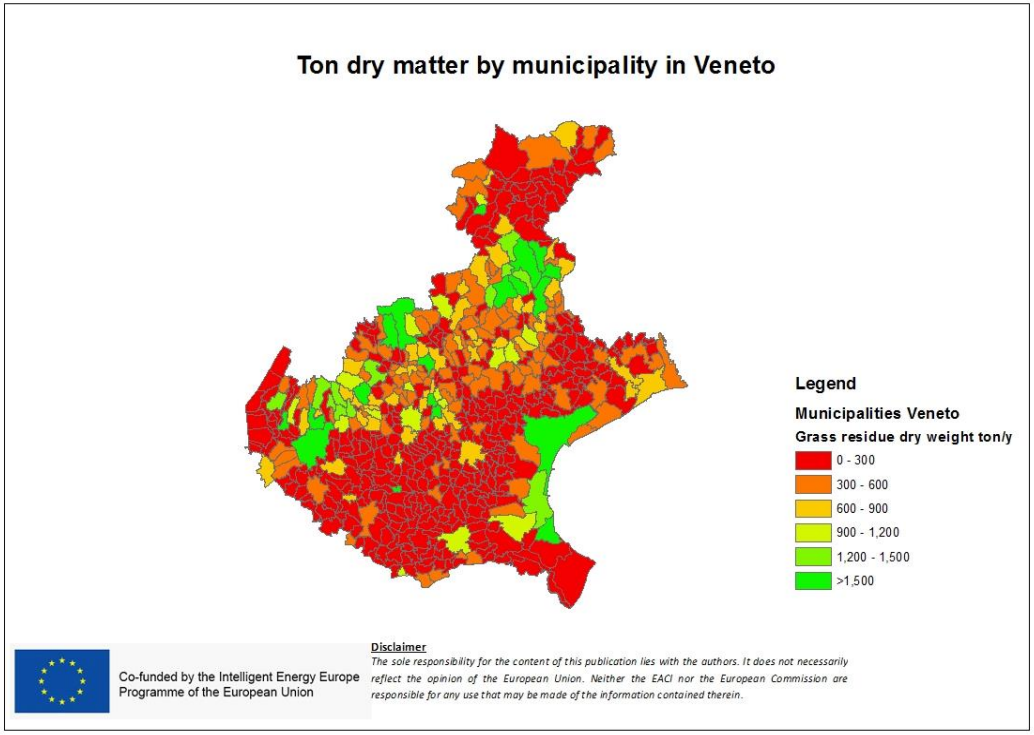
Origin	- Natural areas - Sports courts & Parks - Gardens (household & public) - ~~Buffer zones~~ and other (e.g. airports)
DM	18%
Total	619 000 tonDM/yr Realistic : 152 000 tDM/yr



Grass Inventory

Results – Italy (Veneto Region)

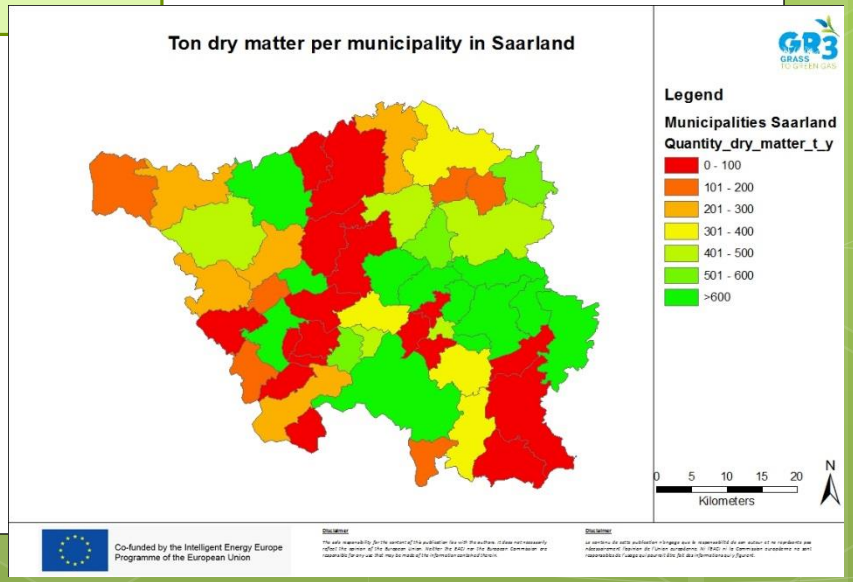
Origin	- Waste (urban areas, railways, …) - Non waste (rural areas, rivers, …)
DM	25 %
Total	200 000 tonDM/yr



Grass Inventory

Results – Germany (Saarland)

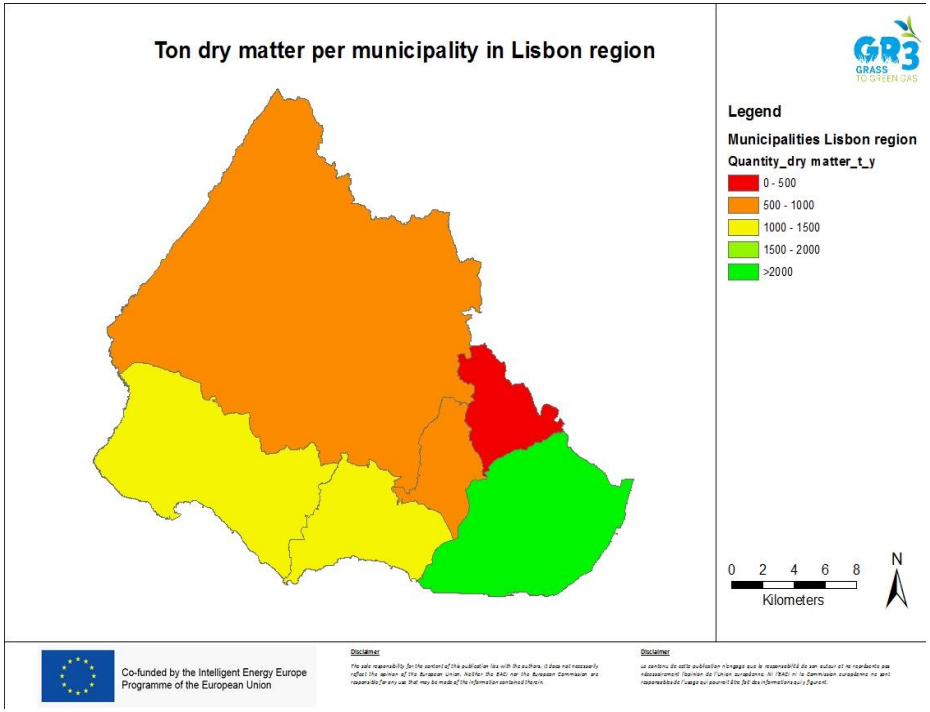
Origin	- Municipalities - Private companies - Composting plants - Green waste collection points - Road sides - Water way banks - Green spaces in reserves
DM	25 %
Total	24 000 tonDM/yr



Grass Inventory

Results – Portugal (Lisbon)

Origin	- Waste collection data (database) - Non-incl grass from street container
DM	27 - 75 % (irrigated vs non-irrigated)
Total	14 000 tonDM/yr



Grass Inventory

Conclusions

- Great variability in data quality
  - "Potential" vs "Real" data
  - "Direct" vs "indirect" approach
  - Over vs under-estimation
- Data not in proportion to size or population
- No grass specific data – often included in "green waste" – data
- A lot of grass left on site
  - big differences in the data between municipalities

Technology : State of the Art

Strategy

Great interest from stakeholders
> 150 downloads

1 – Proven technology

Incl. Case studies

Theory + Practice

2 – Every step in the chain

"End to beginning" approach

3 – Decision makers (investment) + operators

4 – Overview + Economic evaluation (if possible)

Technology : State of the Art

Digesters

- Focus on feed stock quality

Criteria	One-stage versus two-stage digesters		Dry versus wet digesters		Batch versus continuous digesters		High-rate bioreactors
	One-stage	Two-stage	Dry	Wet	Batch	Continuous	
Biogas production	Irregular and discontinuous	Higher and stable	Higher	Less and irregular	Irregular and discontinuous	Continuous	Continuous and higher
Solid content	10–40%	2–40%	20–50%	2–12%	25–40%	2–15%	<4–15%
Cost	Less	More	Less	More	Less	More	More
Volatile solids destruction	Low to high	High	40–70%	40–75%	40–70%	40–75%	75–98%
HRT (days)	10–60	10–15	14–60	25–60	30–60	30–60	0.5–12
OLR ($kgVSm^{-3}d^{-1}$)	0.7–15	10–15 for second stage	12–15	<5	12–15	0.7–1.4	10–15

Figure 1.1: Overview of different types of digesters (Nizamia et al., 2009)

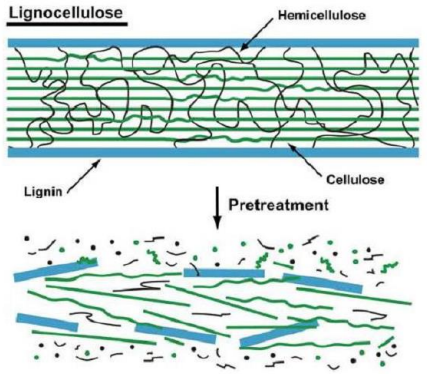
Contaminations (Sand, wood, etc.)
Investment vs. proces
Application Digestate

Technology : State of the Art

Grass as feedstock

- Impact on biogas potential
  - N° of cuts / year
  - Time of mowing (spring vs. summer)
- Low availability dry digesters
- No mono-digestion of grass

Technology : State of the Art



Pre-treatment

- Increase biogas yield
- Lignocellulosic complex
- CBA (consumables and type of biomass)

Biological

Ensiling

Chemical

Physical

Chopping
to < 5 mm

Contaminations (Sand, wood, etc.)

Technology : State of the Art

Mowing, purification and storage

- Mowing :
  - 1 pass vs. multiple passes
  - Technical data on mowers
  - Influencing factors
    - Physical / Soil & Weather / Legal framework
- Purification :

	Mowing	Transport	Pretreatment	Reactor	Digestate
Sand	np	Dead weight	"Corrosion" of "abrasive"? -	Dead weight corrosion piling up -	np
Litter, stones		np	--	--	--
Heavy metals, mineral oils	np	np	np	-	---
Wood	np	Dead weight	np	Dead weight piling up	np

Technology : State of the Art

Economic analysis – supply chain

Table 4.9: Current market prices in Flanders

	Scenario				Reference	Remark
	1	2	3			
	Cost/ton (€/ton)					
Disk mowing	x	x		10	Market price	30 euro/h
Flail mowing with suction			x	20	Market price	
Windrowing/tedding	x	x		10	Market price	30 euro/h
Shredding	x			22	Contractor	
Baling		x		40	(Elsen et al., 2009)	
Transport bulk	x		x	4	Contractor	25 km
Transport Bales		x		5	Contractor	25 km
Ensiling Bulk	x		x	10	(Elsen et al., 2009)	
Scenario cost:	56	65	34			

Technology : State of the Art

Supply chain : practical aspects

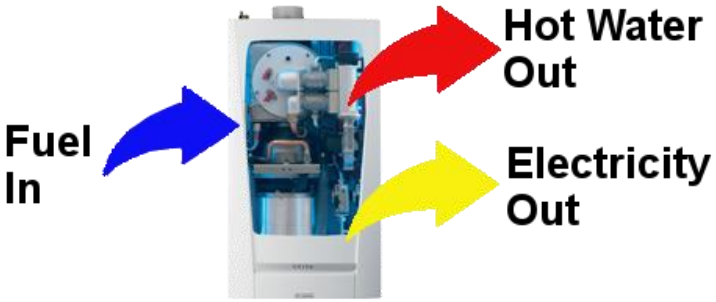
- Physical constraints:
  - (Reduced) surfaces
  - Natural (and arteficial) barriers
  - Accessibility
- Timing
- Legal constraints
- Safety issues
- Logistics
  - Direct transport vs. Biomass hub
- Quantities

Technology : State of the Art

Biogas Valorisation

- Composition raw biogas
- Biogas cleaning

CHP



Biogas upgrading

Technology : State of the Art

Biomass quality prediction Tool

INPUT

GENERAL INFORMATION			
Volume reactor	2000	m³	DOWNLOAD MANUAL
Cost digestate	100	Euro/ton DM	
Biogas price	0,4957	Euro/m³	

FEEDSTOCKS	Type	Ton FM/day	Price per ton FM
Feedstock 1	Pig slurry	40	-16
Feedstock 2	Cattle slurry	30	-14
Feedstock 3	<none>	0	0
Feedstock 4	<none>	0	0
Feedstock 5	<none>	0	0
GRASS FEEDSTOCK	Grass silage	5	-20

SPECIFICATIONS FOR GRASS		
Type of grassland	Storage	Month of mowing
Grassland type 1	Fresh	January

BIOGAS INFORMATION GRID

Feedstock	BGP(l/kg DM)	%DM	time to make 75% of BGP (d)	C/N
<none>	0	0	0	0
Pig slurry	150	10	19	5
Manure	270	10	19	12
Maize silage	610	35	15	40
Cattle slurry	250	10	19	5
Glycerol	910	80	12	500
Oil and Fat	910	100	13	400
Others	100	10	10	10
Grass silage	360	55,3661	18	30

Technology : State of the Art

Profitability calculation tool

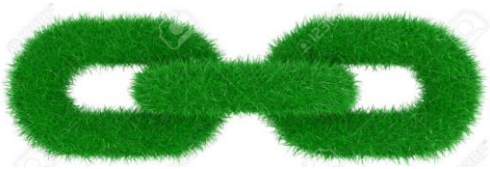
MODEL RESULTS				
for every ton FM of	Pig slurry	you digest, you make	12,00	euro
for every ton FM of	Cattle slurry	you digest, you make	14,00	euro
for every ton FM of	<none>	you digest, you make	NaN	euro
for every ton FM of	<none>	you digest, you make	NaN	euro
for every ton FM of	<none>	you digest, you make	NaN	euro
for every ton FM of	Grass silage	you digest, you make	45,83	euro

BUSINESS IMPROVEMENT BY USE OF GRASS RESIDUES			
For 1 ton FM of grass silage/day from roadside verges, moderately stored and harvested in September			
price (negative means gate fee):	-40	euro	
you would make or lose	26,33	euro	
For 1 ton FM of grass silage/day from nature manangement grassland, fresh and harvested in May			
price (negative means gate fee):	-20	euro	
you would make or lose	33,21	euro	
It would be better if you replaced your	Pig slurry	with	Nature management grass
PARAMETER CONTROL			
7,1%	You digest grass but don't worry		
10,7%	This DM content is accepable for a wet digester		
6,7	This C/N ratio is too low, you can add grass or maize		

Impact assessment

Strategy

- Estimation total amounts
- Impact on different levels
  - Social : job creation
  - Environmental : LCA
  - Economic : CBA



Benchmarking : MANUALS

Impact assessment

Estimation amounts (ton DM/year)

Region	Nation	Europe
Flanders 60 000	Belgium 128 000	> 30 000 000 (based on surface) = > 7 billion Nm^3 biogas / year
Denmark 152 000	Denmark 152 000	
Veneto 200 000	Italy 1 110 000	
Saarland 24 000	Germany 3 300 000	
Lisbon 14 000	Portugal 2 200 000	

Impact assessment

Capacity biogas plants

Region	Number of biogas plants	Willingness to accept grass
Flanders	38 in operation	Low (Max. 7) Process issues
Denmark	65 – 70 in operation and likely to accept grass	Low Mainly cultivated grass (straw + deep litter)
Veneto	20 Industrial 120 Agricultural	Industrial -> no interest Agricultural -> legal constraints
Saarland	14 in operation (small scale)	Higher But permanent grass lands
Portugal	9 on biowaste 18 on manure	Interest is "grass residues" in 3 – 4 plants

Impact assessment

Life Cycle Analysis

Interest from authorities
Food for discussion

Functional unit :
Managing 1 ton of freshly harvested grass

Reference : Left on site

Scenario 1 Biogas

a) Extrusion (50% grass)

b) Max grass (99%)

Scenario 2 Composting

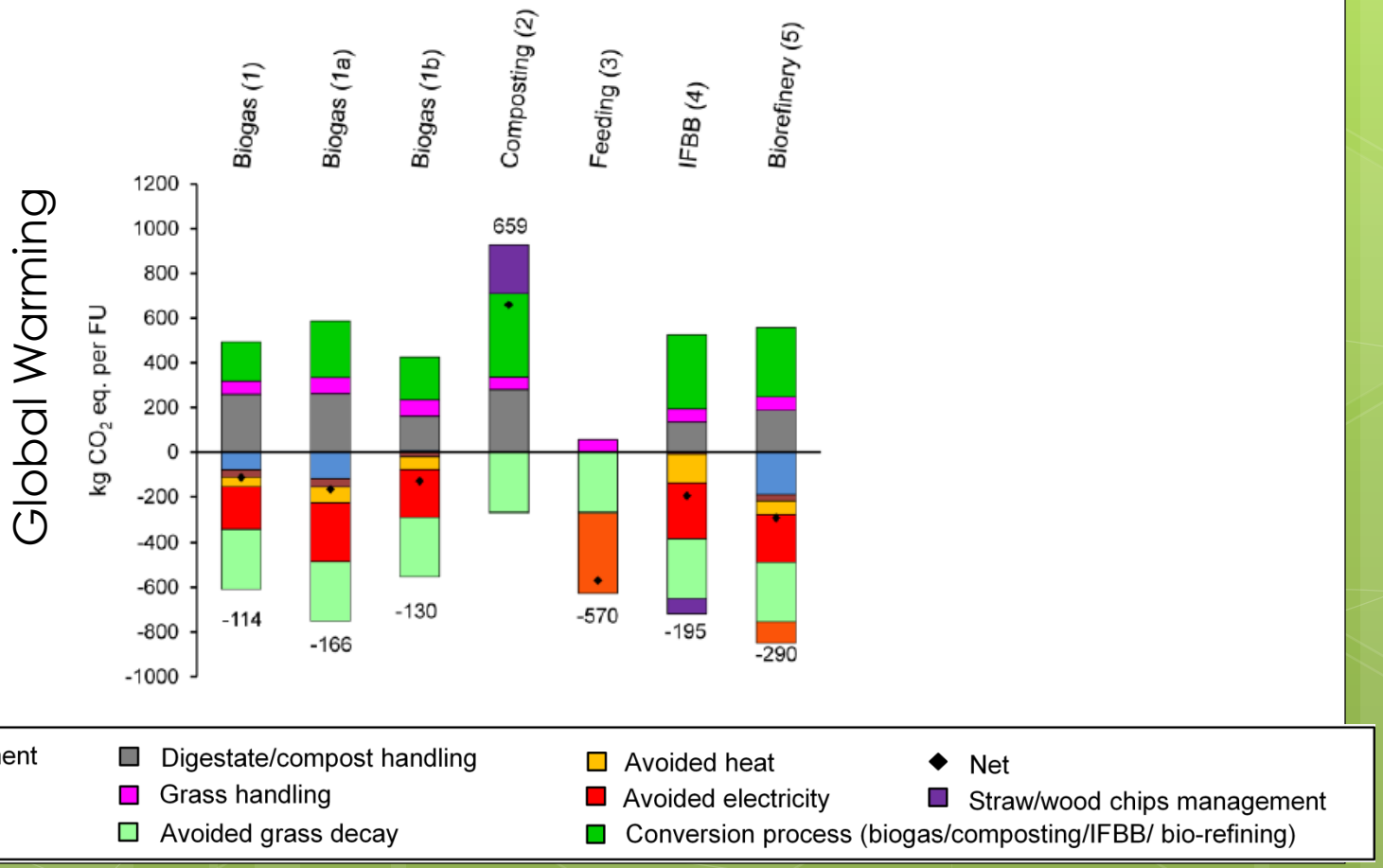
Scenario 3 Animal feeding

Scenario 4 IFBB

Scenario 5 BioRefinery

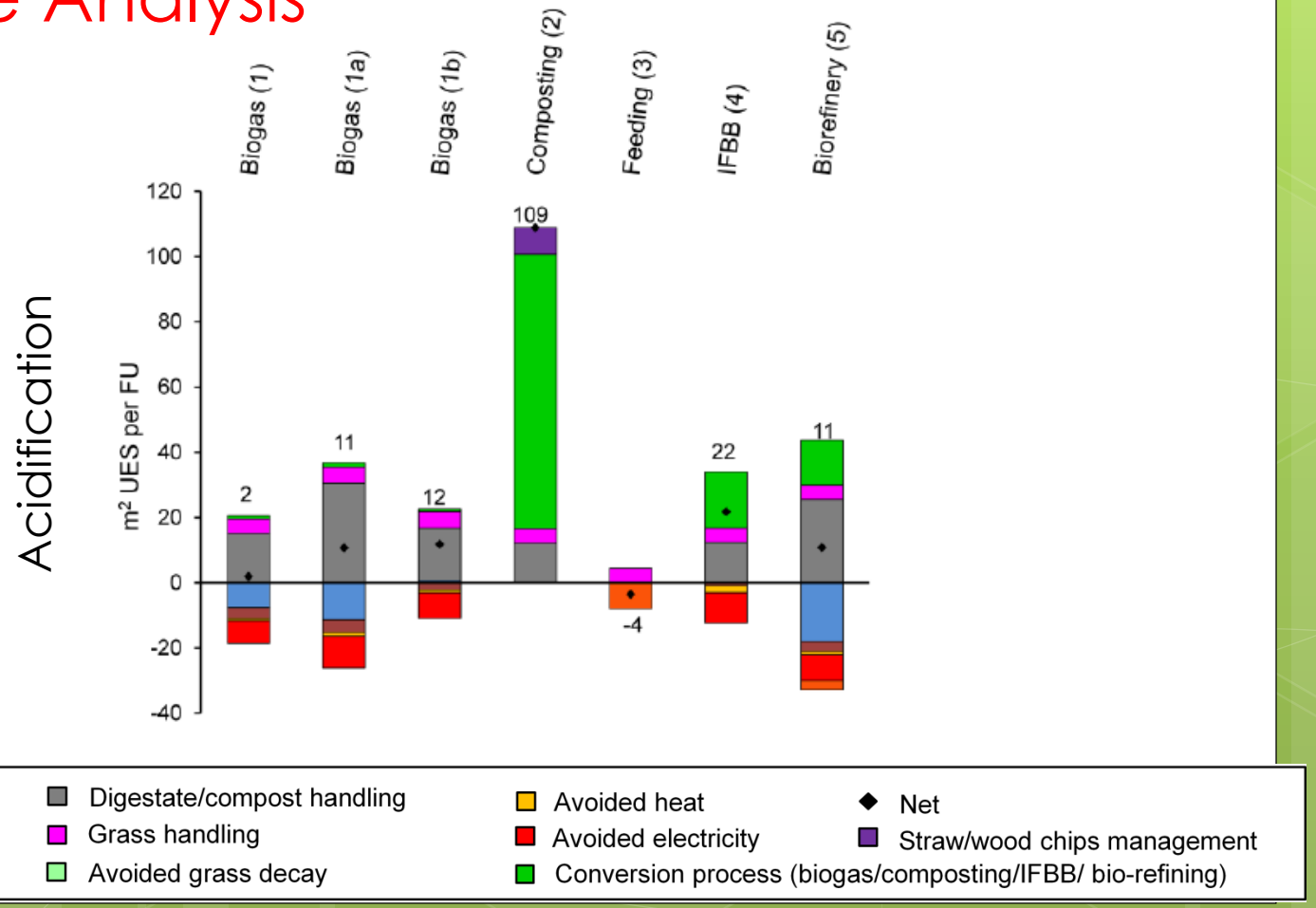
Impact assessment

Life Cycle Analysis



Impact assessment

Life Cycle Analysis



Impact assessment

Life Cycle Analysis - Conclusions

- Maximum protein recovery (animal feed and biorefinery) gives best results
- Composting leads to increase of environmental impact
- Acidification increases (NH_3 production)
- Enhanced biodiversity (not reflected in LCA)
- Huge benefit of co-digestion of manure in combination with grass

Impact assessment

Cost Benefit Analysis

Reference : Mulching (Scenario 6)

Scenario 1 Wet fermentation

Scenario 2 Biogas + IFBB

Scenario 3 Dry Fermentation

Scenario 4 Animal feeding

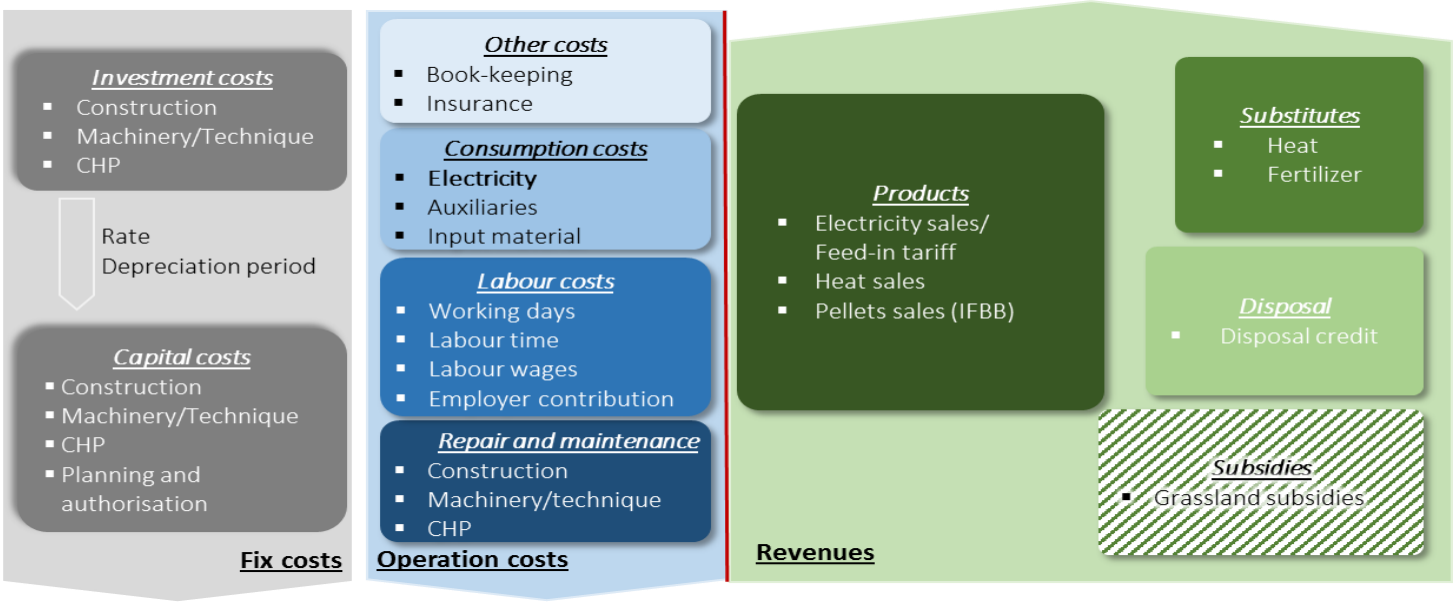
Scenario 5 Compost

Impact assessment
Cost Benefit Analysis

Investment

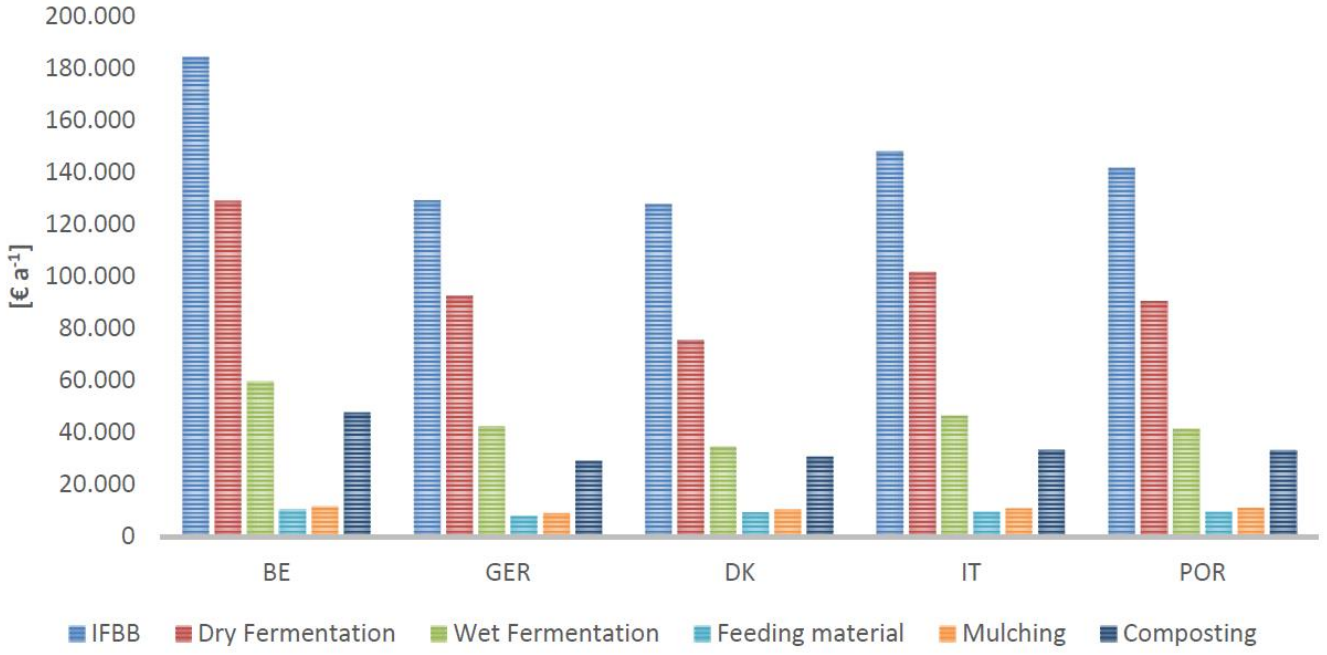
Operational costs

Revenues



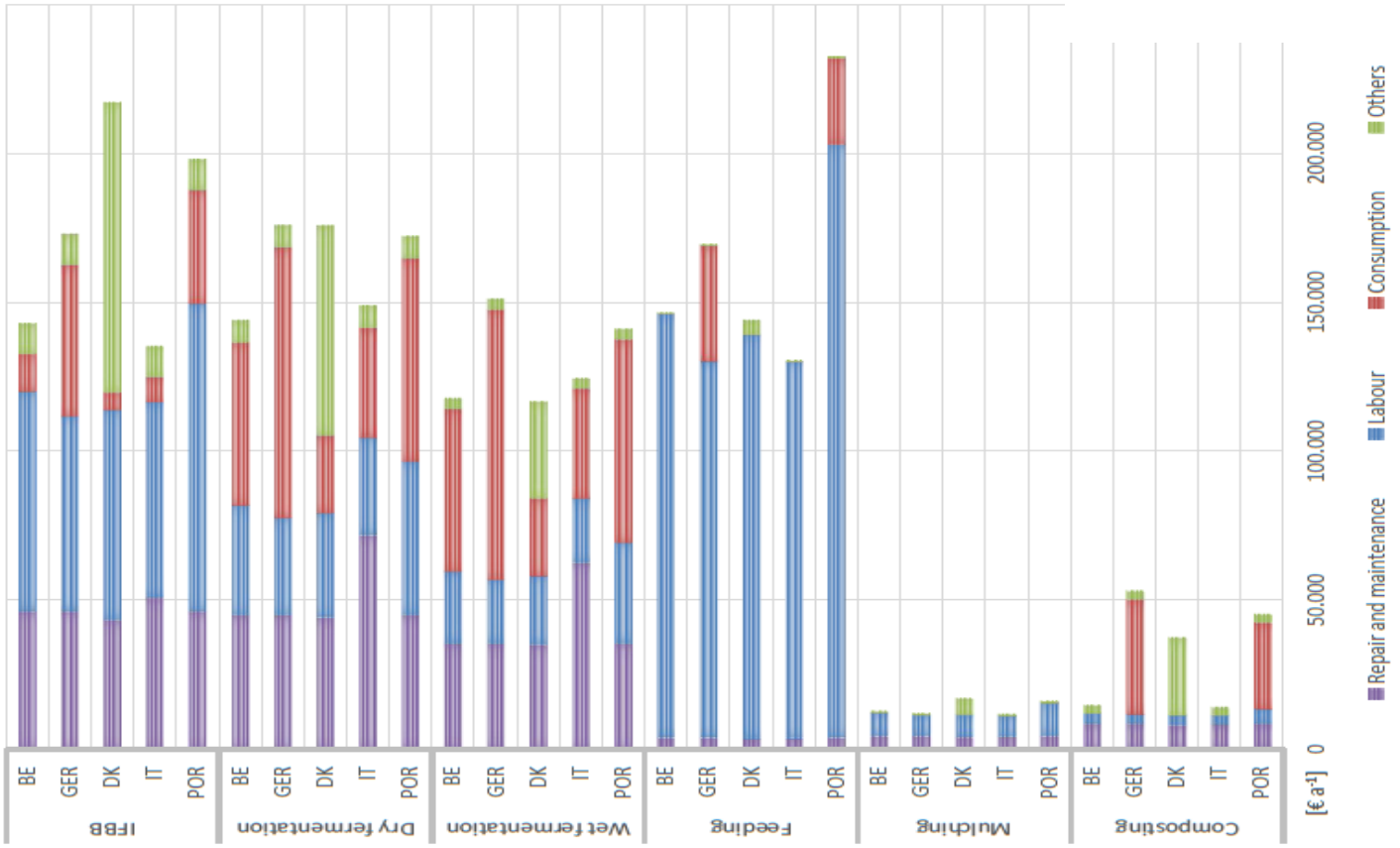
Impact assessment

Cost Benefit Analysis



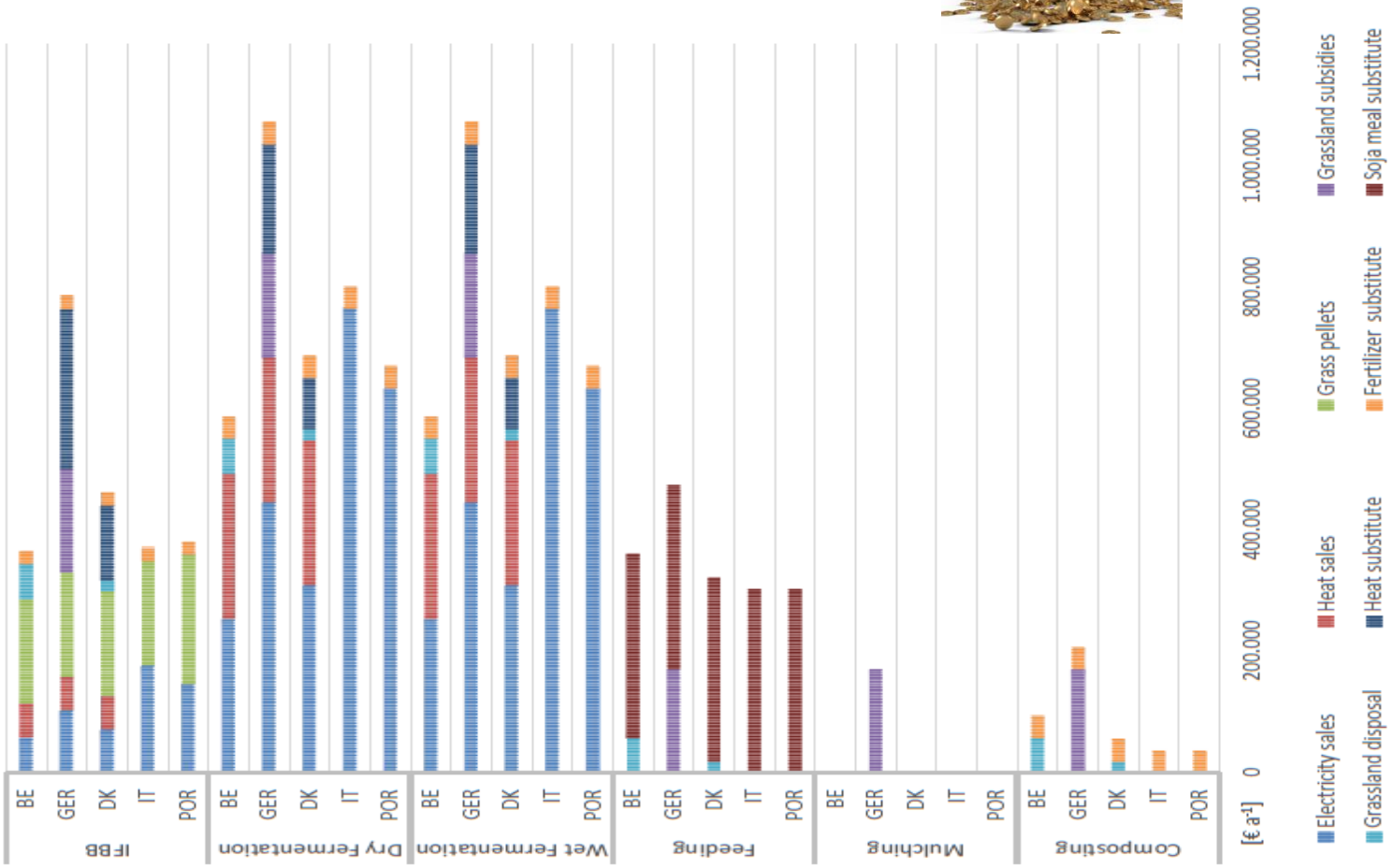
Impact assessment

Cost Benefit Analysis



Impact assessment

Cost Benefit Analysis



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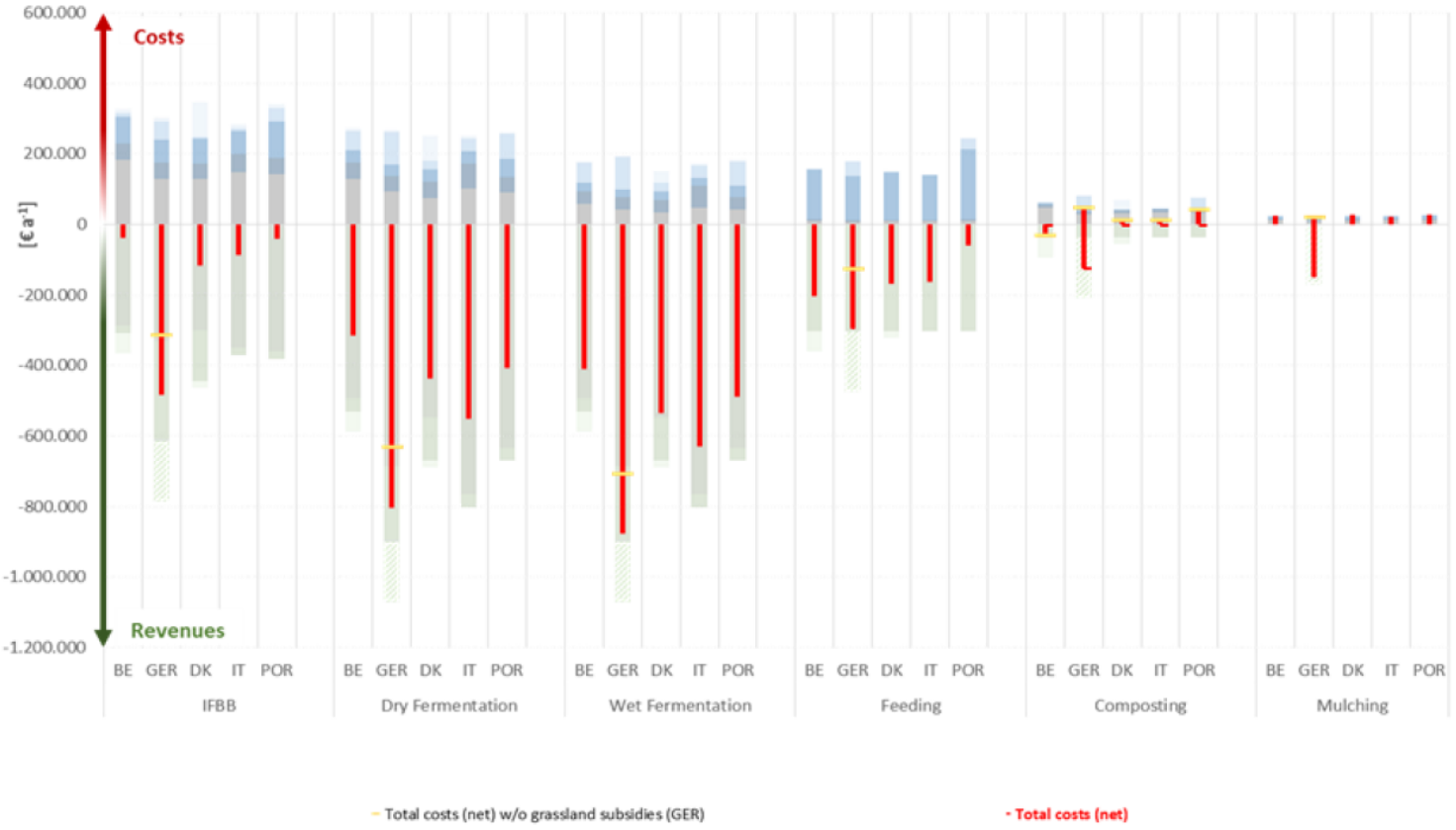
Cost Benefit Analysis



Impact assessment

Cost Benefit Analysis - NPV

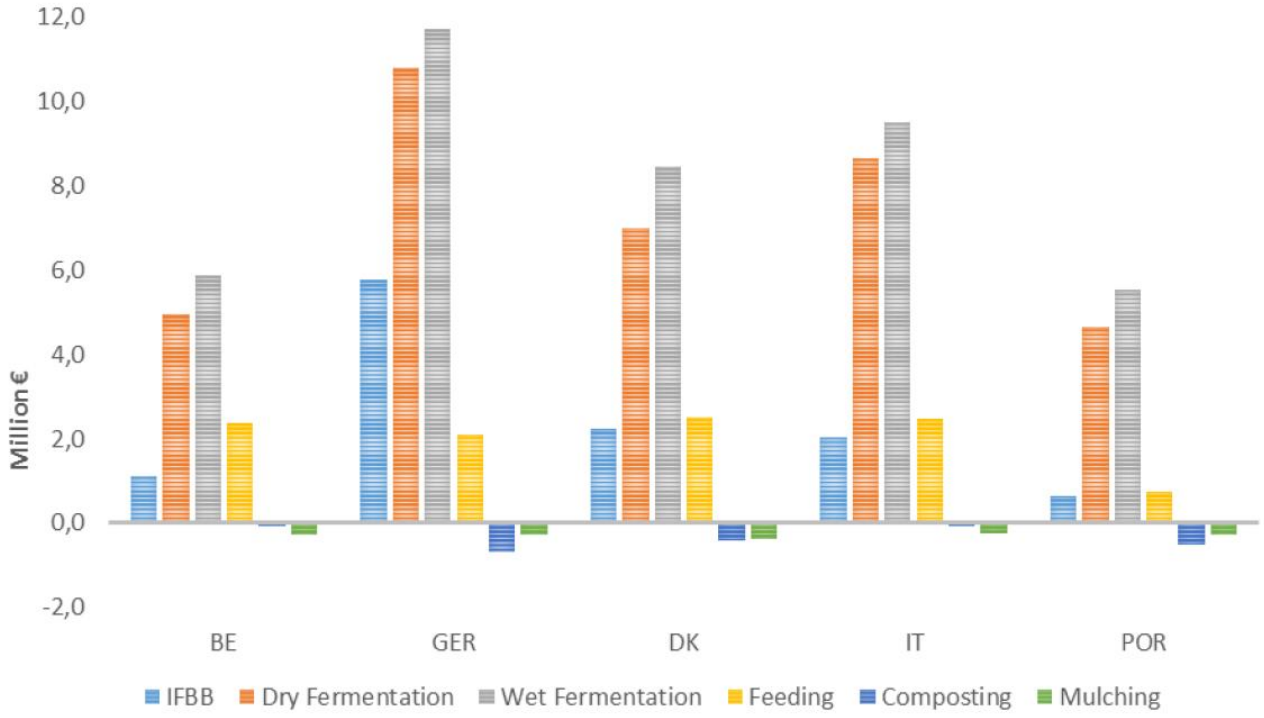


Figure 19: Comparison of net present value of selected scenarios in all project countries

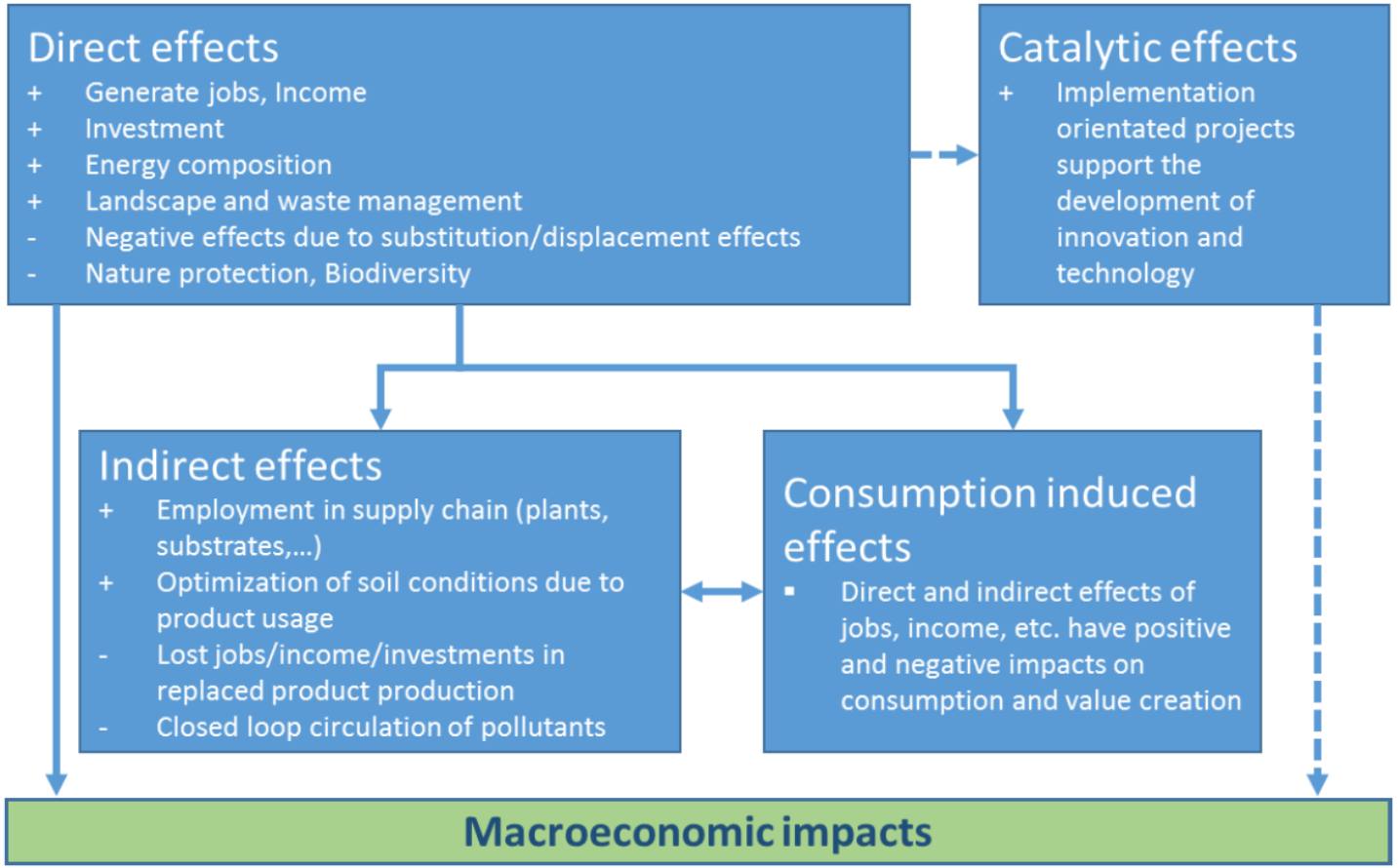
Impact assessment

Cost benefit analysis - Conclusions

- Generally revenues > costs
- IFFB & fermentation : clear benefits
- Mulching & composting : only benefit in Germany
  - Germany : grassland subsidies
- Cost for loading & transport vs. leaving on site:
  9,11 €/ha vs. 105 €/ha (Germany)

Impact assessment

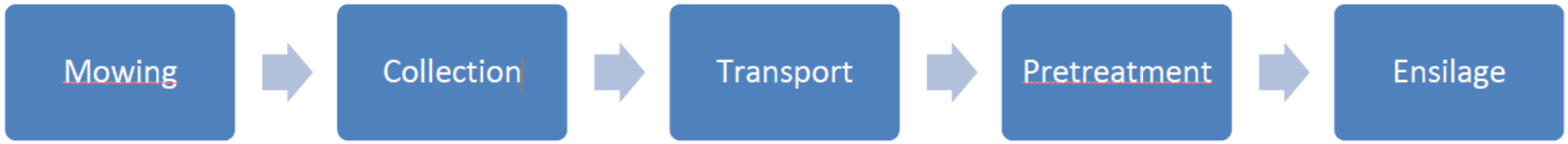
Cost benefit analysis - Conclusions



Impact assessment

Social – Employment analysis

- Assumptions :
  - 10 % of biomass feed = grass
  - Wet digesters



Impact assessment

Social – Employment analysis

Table 2: Full Time Equivalents in the supply chain for grass digestion in a typical plant in each region.

	Flanders	Denmark	Saarland	Veneto Region	Great Lisbon
Typical plant (ton fresh biomass/year)	60.000,00	100.000,00	18.980,00	30.000,00	60.000,00
Hours/year for one FTE	1.576,00	1.438,00	1.363,00	1.733,00	1.852,00
Mowing + collecting	1,13	1,71	0,39	0,50	1,09
Transport	0,43	0,61	0,06	0,15	0,35
Pretreatment	1,37	0,00	0,36	0,56	2,11
Ensilage	0,00	0,00	0,00	0,00	0,00
Total	2,92	2,32	0,81	1,22	3,55

Impact assessment

Social – Employment analysis

Table 3: calculation per GR3-region of the hours per year and per ton (fresh material) of grass per that are needed for the construction and maintenance of a typical AD plant.

	Flanders	Denmark	Saarland	Veneto Region	Great Lisbon
Average AD-plant (tons (FM) of biomass)	60.000,00	100.000,00	18.980,00	30.000,00	60.000,00
Amount of grass (tons FM)	6.000,00	10.000,00	1.898,00	3.000,00	6.000,00
Power generated by average plant (GWh)	21,14	35,24	6,69	10,57	21,14
%power from grass in AD plant	5,68	5,68	5,68	5,68	5,68
FTE for maintanance average plant	2,96	4,93	0,94	1,48	2,96
FTE for construction average plant	8,88	14,80	2,81	4,44	8,88
FTE construction average plant depending on grass	0,17	0,28	0,05	0,08	0,17
FTE maintanance average plant depending on grass	0,50	0,84	0,16	0,25	0,50
Hours/year for one FTE	1576	1438	1363	1733	1852
Hours/year/ton (FM) grass for construction	0,04	0,04	0,04	0,05	0,05
Hours/year/ton (FM) grass for maintenance	0,13	0,12	0,11	0,15	0,16

Impact assessment

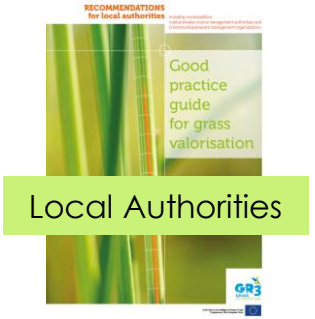
Social – Employment analysis

Table 5: Total employment potential if all roadside grass from Flanders were to be digested.

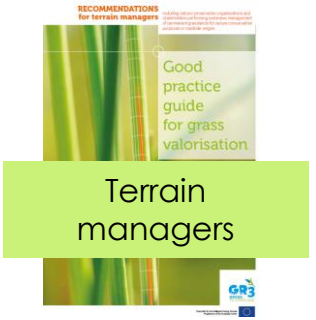
	Flanders	Denmark	Saarland	Veneto Region	Great Lisbon
Supply chain	107,19	442,06	38,02	101,46	30,78
Mowing + collecting	41,35	325,41	18,38	42,04	9,47
Transport	15,68	116,65	2,83	12,54	3,06
Pretreatment	50,16	0,00	16,81	46,88	18,24
Biogas plant	24,64	213,63	9,96	28,00	5,82
Construction	6,16	53,41	2,49	7,00	1,46
Operation & Maintenance	18,48	160,22	7,47	21,00	4,37
Total	131,83	655,69	47,97	129,46	36,60

Impact assessment

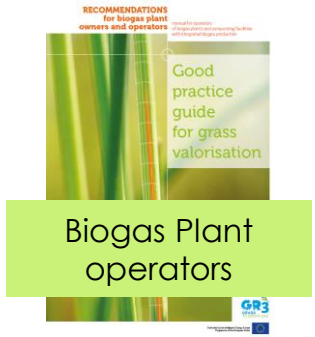
Manuals



Local Authorities



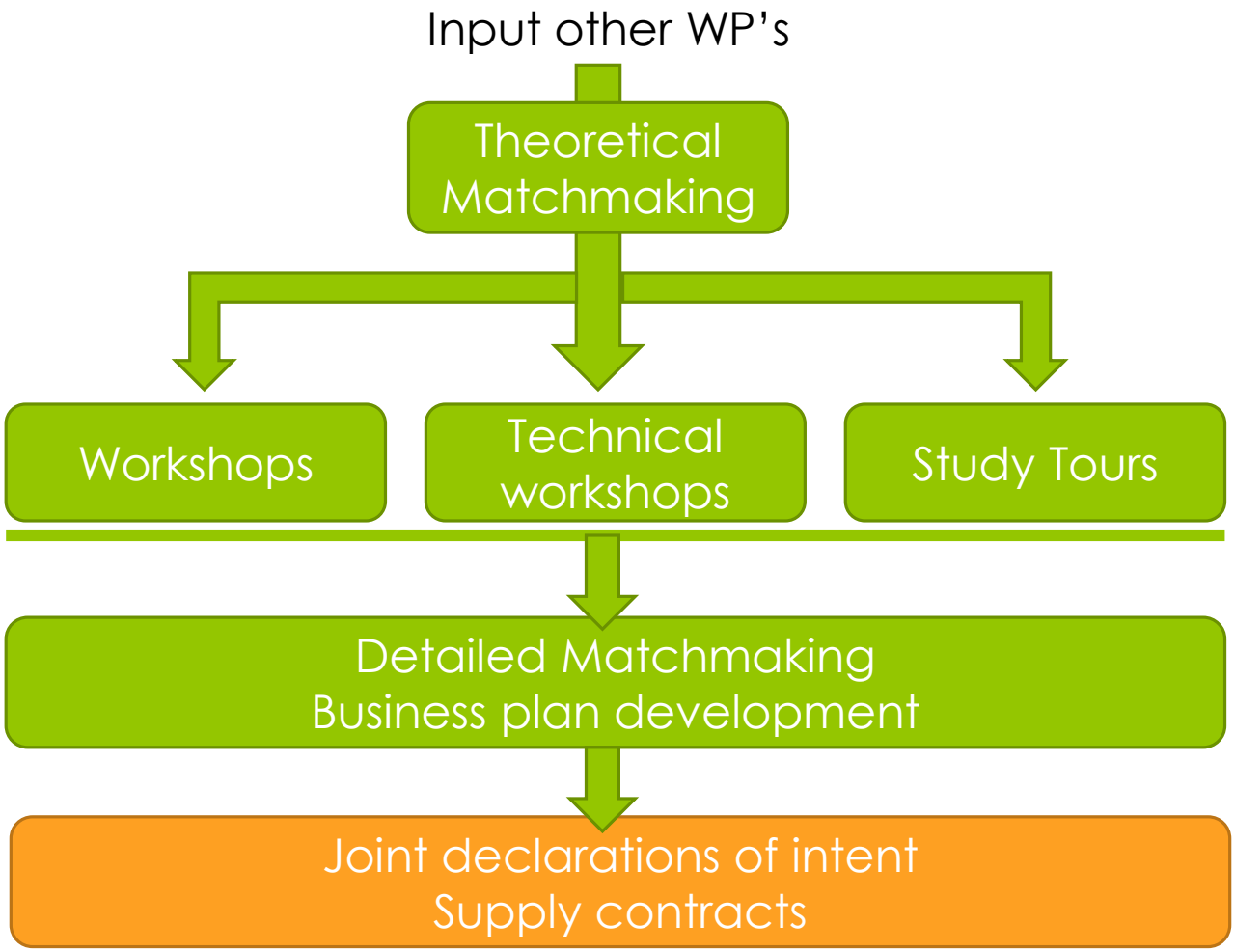
Terrain managers



Biogas Plant operators

Business plan development

Strategy



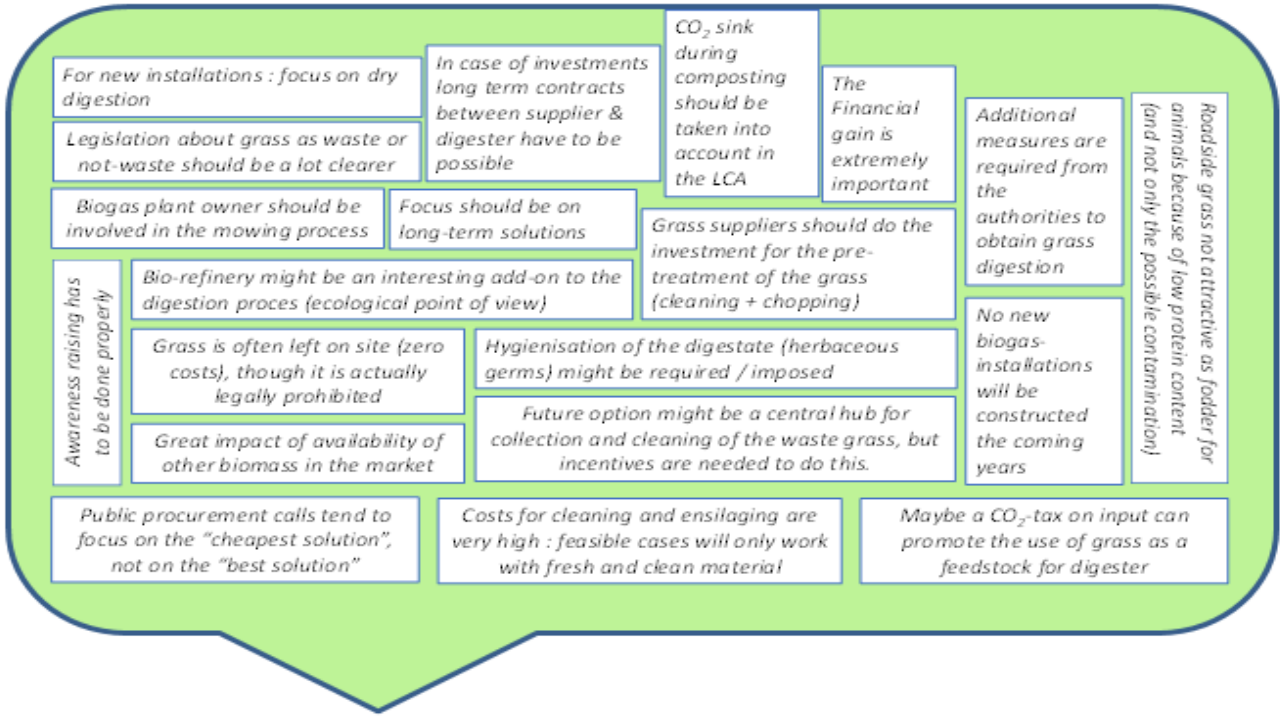
Business plan development

Workshops

3 workshops in every target region

Interactive (results + discussion)

Mixing target groups



Total: 488 stakeholders

> 40% Policy makers (!)

Business plan development

Technical workshops

2 Workshops

Italy
Belgium

Technology demonstration
Supply chain

Total: > 140 stakeholders

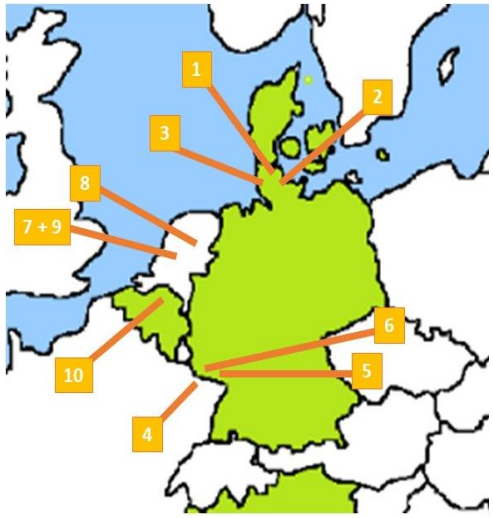
Business plan development

Study Tours

3 Study Tours

Denmark
Germany
Belgium

Proof of concepts
10 installations



6 Wet digesters (clean grass sources)
4 Dry digesters (grass from roadsides)
Different pre-treatment systems
Small to big scale installations

Total: > 40 stakeholders

Business plan development
Business Cases

- **Actual situation**
  - Roadside grass now to composting (or dumped)
  - Nature areas : dumped (or animal fodder)
  - 10% of grass clippings is processed

- **Results**
  - **> 10 business cases** developed (both supply and biogas side)
    - Possibilities for > 24 000 ton of grass evaluated
  - **Lack of interest from existing biogas installations**
    - Low price of Maize -> impact on price of "better quality" waste
    - Might change in the future
  - **Municipalities** interested in possibilities within their own scope
  - **Investment** by technology supplier(**Van Daele**)
  - Feasibility study for pre-digestion before composting (**IVM**)
  - Supply chain : competition with (illegal) leaving in situ = impossible

Business plan development

Business Cases

Bottle necks

- Policy makers push towards dry fermentation (subsidy)
- More stringent legislation
- **Lack of interest from existing biogas installations**
  - Low price of Corn
  - Future?

Most relevant cases :

- Natuurmaaisel Limburg : 1200 ton/yr
- ATB : private company (gardening) : 200 ton/yr
- BAC – GGP : 1600 ton/yr
  (should lead to contract – but SLOW !!!!)
- Intermunicipality IVM : 4500 ton / yr
- Municipality Beersel: 410 ton/yr
- Full scale Digester NPG : 13 000 ton/yr
- Full scale digester Greenergy : 230 ton/yr (= "*Contract*")

Business plan development

Business Cases

- **Actual situation**
  - Roadside grass now left in place (or composting)
  - Waterside grass now left in place
  - Nature areas : left in place (or landfills)
- **Results**
  - > 30 1-on-1 meetings
  - 5 business plans developed (2 biogas, 3 supply chain)
    - > 1000 ton grass/yr studied
- **Bottle neck**
  - Current legislation (Agricultural plants are interested, but can't digest waste grass)
  - Very limited new biogas installations
- **Most relevant cases**
  - Cooperativa Sociale Coislha – 585 ton/yr
  - Cooperativa Primavera – 650 ton/yr
  - Morandi – 650 ton/yr
  - Possamai – 300 ton/yr
  - Schmack – 750 ton/yr

Business plan development

Business Cases

- **Actual situation**
  - Roadside grass now to composting
  - Waterside grass now on site
  - Nature areas : animal fodder + bedding
- **Results**
  - > 10 1-on-1 meetings
  - 3 business plans developed (1 biogas, 2 supply chain)
    - > 15 000 ton grass/yr studied
  - 3 contracts signed (total 15 000 ton/yr)
- **Bottlenecks**
  - Incentives or biogas sector and grass digestion go down
  - Diminished support for agricultural grass digestion
  - Very limited (almost zero) construction of new plants – uncertain situation due to the changess in the Renewable Energy Act.
- **Most relevant cases**
  - Okostrom Saar
  - Sydeme
  - EVS, Entsorgungsverband Saar

Business plan development
Business Cases

- **Actual situation**
  - Legal to dump on site
  - 25% to composting plants

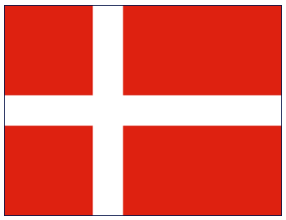
- **Results**
  - 4 business plans developed (1 biogas, 2 supply chain)
    - > 19 000 ton grass/yr studied
  - 2 Business plans / feasibility pre-digestion before composting
  - Investment new feeder system (Algar – 5000 €)

- **Bottlenecks**
  - Negligible biogas production by private companies (farms)
  - Mostly Waste management companies

- **Most relevant cases**
  - Intermunicipality Amarsul – 6000 ton/year
  - Intermunicipality Tratolixo – 6000 ton/year
  - Intermunicipality Algar - 5000 ton/year
  - Intermunicipality Valorsul – 2000 ton/year

Business plan development

Business Cases



- **Actual situation**
  - Roadside grass now on site
  - Nature areas : on site + feeding (grass pills)
  - Gardens (collected household + public): now mostly composting (>75%)

- **Results**
  - 2 business plans developed (1 supply , 1 biogas plant)
    - > 3 200 ton grass/yr studied
  - 1 Business plans / feasibility pre-digestion before composting

- **Bottlenecks**
  - Adjustment energy goals (50% digestion of manure)
  - More interest in Straw digestion, in stead of grass digestion

- **Most relevant cases**
  - Municipality Sonderborg – 7000 ton/yr

CPI's obtained

- > 20 cases evaluated
- 70 000 ton/yr grass residues evaluated

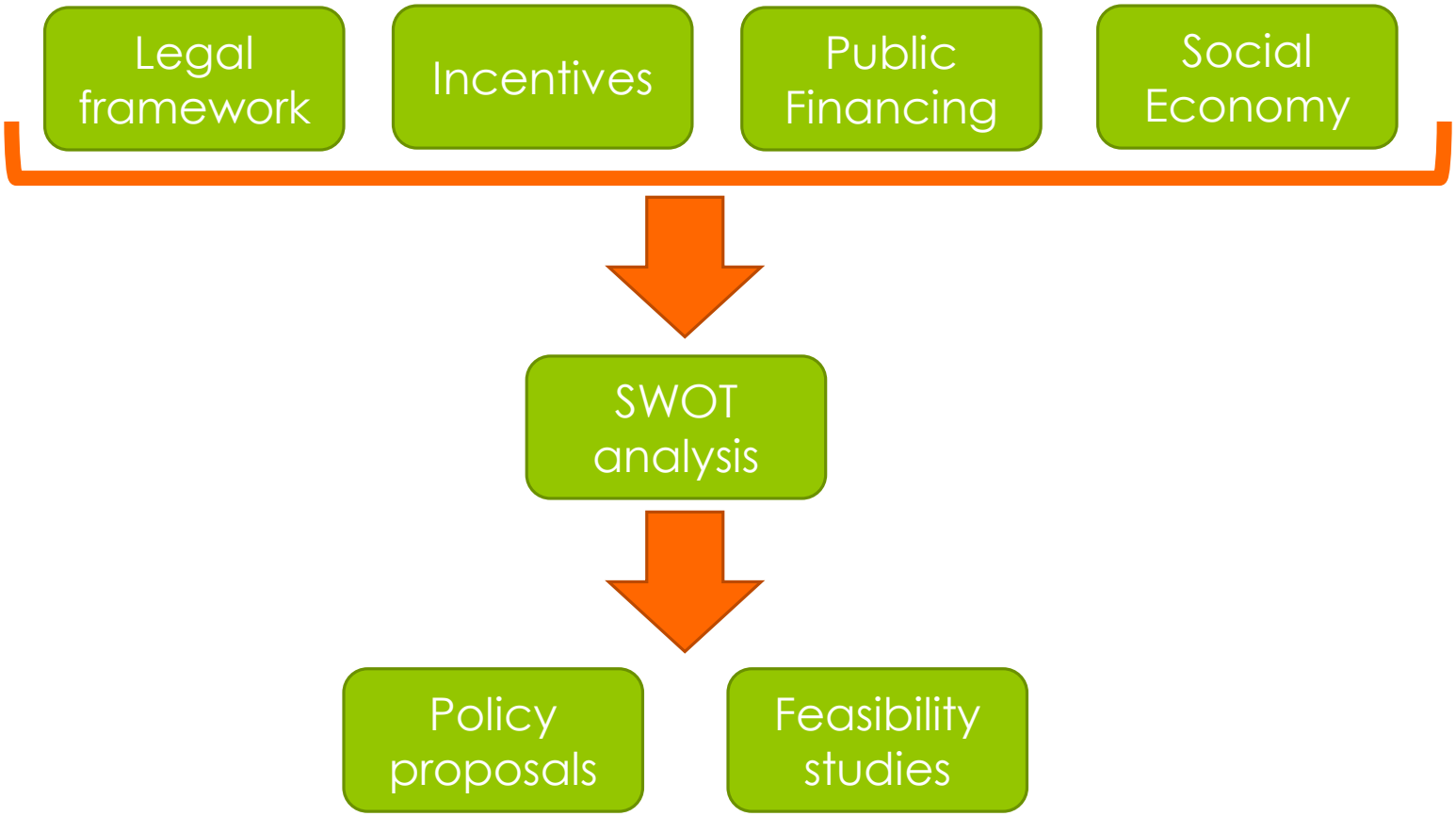
  Problems with economies & legislation
- 25 000 ton of grass digestions/yr

  Some still under negotiation (Belgium + Portugal)

Primary energy saved	**Renewable energy produced**	**Reduction of GHG**
67 toe/year	1670 toe/year	11 400 ton CO_2eq/yr
Less composting	Biogas production Wood-combustion (wood not used for composting)	Avoided uncontrolled emissions Savings of primary energy

Non-tech barriers & opportunities

Strategy



Non-tech barriers & opportunities

Legal Framework & Incentives

Waste ⟷ Product

- Waste vs Agricultural digester
- Composting
- Origin
- Collection & storage
- Feedstock "competition"
- Technology required

Non-tech barriers & opportunities

Legal Framework & Incentives

	DENMARK	FLANDERS	ITALY	GERMANY	PORTUGAL
Incentive for renewable energy (electricity) production					
Feed-in tariff system[3]	●		●	●	●
Quota certificate system		●			
Extra incentives/ restrictions on heat use		●	●	●	
Grass as waste					
More specific national organic waste definition[4]		●	●	●	
Separate (regularly paid off) municipal collection	●	●	●	●	●
Bring system to municipal greenery parks	●	●	●	●	●
Mutual collection with household waste	●				●
Gate- fee for grass	●	●			●
Extra incentives for renewable energy production			●	●	
Grass as a product					
Extra incentives for renewable energy production				○	
Gate- fee for grass					●
Restriction on digestate management dependent on different grass origins			●	●	

Legend:
● legally valid since 2014
○ legally valid for biogas plants installed before July 2014
● dependent on municipalities

Non-tech barriers & opportunities

Legal Framework & Incentives

- **Incentives** for production of renewable energy exist, but go down
  Germany : additional incentive for grass digestion
  (from 2014 only grass as waste)
  Denmark : increased support for biogas
- **Separate collection services** are in place (incl. VGF-collection)
- Valorisation of **bio-waste** (incl. grass):
  - Technical requirements process (stabilization & hygienisation)
  - Quality of resulting fertilizers
  - Eligibility for bio-waste incentives

(Non) Obligation in **collection** of grass residues
Trend towards "**monopoly**" for grass valorisation
Waste legislation : "landfilling" vs. "processing"
EU Waste regulation vs. Local regulations

Non-tech barriers & opportunities

Public Financing strategies – social employment

- **Insights** on how it works
- Possibilities in nature maintenance and waste management
  - Obstacle mowing
  - Logistics
  - Triaging biomass (recycling parks)
  - Litter removal
- Strategies for public financing
  - **SGEI**(Services of General Economic Interest)
  - **SRPP** (Socially Responsible Public Procurement
  - Inclusion in public procurement

Non-tech barriers & opportunities

STRENGTH
- AD as tool for waste management
- Subsidies for nature management
- Increased incentives bio-waste vs. energy crops (IT, GE)
- Improve proces stability (C/N)
- Digestate as fertilizer

WEAKNESSES
- Grass = bioWASTE
- Insufficient awareness of technologies
- Roadsides grass : complex pretreatment
- No specific “grass incentive” in AD
- Stakeholders don’t know each other
- Grass often left on site

Non-tech barriers & opportunities

OPPORTUNITIES

- Substitution of energy crops
- Better grass valorisation incentives
- Grass from urban and suburban areas - > often cut, green and combined collection systems

THREATS

- More elaborate legal requirements digestate
- Contractors focus on disposal costs, AD-operators focus on good quality feedstock
- Transport + gate fee vs. leaving in situ
- Support to AD goes down

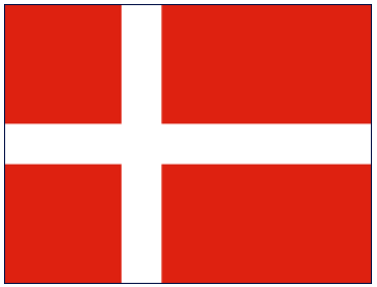
Non-tech barriers & opportunities

Policy proposals

1. Status "waste" to "secondary resource"
2. Better control on implementation of the Verge Decree
3. "Pro Rata" status of animal manure for digestate
4. Incentives (€) for grass processing
5. Facilitate small scale pilot projects -> how can "burden" be lowered?
6. Incentive for CO_2 reduction compared to other feedstock

Non-tech barriers & opportunities

Policy proposals



1. Lower amount of allowed energy crops
2. Increase awareness on dumping of road side grass
3. Economic remuneration of natural area management for mowing (and collection), reflecting the value of enhancing biodiversity
4. Limit the amount of urban grass that can be processed in composting plants

Non-tech barriers & opportunities

Policy proposals

1. New and clear definitions of waste vs. by-product vs. other residual organic material
2. Subsidies for the grass chain
    1. Incentive for collected material (gate fee)
    2. Defiscalisation for companies involved in the grass chain
    3. Incentives for (social) cooperatives involved in the grass chain

Non-tech barriers & opportunities

Policy proposals

1. Accountable long-term legislation
2. Increase incentives (biogas general or grass)
3. Clear legislation on grass as a product or waste
4. Seperate remuneration for grass digestion
   Need for "cost efficient" production
5. Further support maintenance of permanent grassland
6. Eco-System-services financed by own funding programmes
7. Improvement of the seperation system for greenery cuttings + financial support

Non-tech barriers & opportunities

Policy proposals

1. Modify grass classification
2. Increase financial support to the biogas sector
3. Separate incentives for grass digestion
4. Support of biomethane production

Non-tech barriers & opportunities

Policy proposals

1. Legal status of mowed grass
   - Waste or by-product
   - Possibilites for agricultural digesters
2. Subsidy for the use of grass
   - mowing to storage : 20 – 30 €/ton
   - left in place : 10 €/ton

1, increased renewable energy from non-food biomass
2, Recycling of organic waste
3, Job creation

Non-tech barriers & opportunities

Feasibility differentiated gate fee system

- Based on case Municipality Beersel
- Increase of the price of VGF-bags
  - Disposal of grass remains unchanged
- Increase of the price of VGF-bags
  - Increased income for municipality
  - Reduced cost for disposal of VGF

Positive impact of differentiation
Case only feasible with disposing digestate to arable land

Non-tech barriers & opportunities

Feasibility Land owner management fees

- Added financial need for farmers for extensive permanent grassland management
- Comparison: maize silage (arable land) vs. grass silage

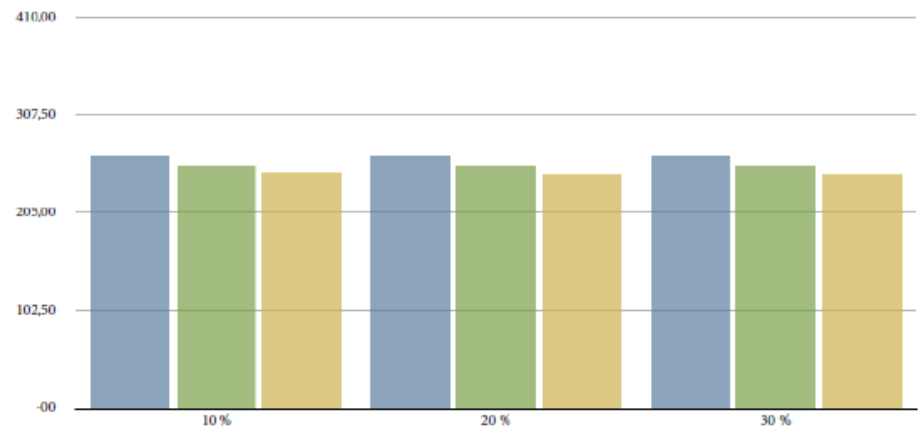


Figure 4: Difference in profit in EUR/ha between a biogas plant (EEG 2012) with maize & manure and maize, manure & grass [1] by 10%, 20% and 30% grass input

Need :
245 – 436 €/ha subsidy

(now: 102 -316 €/ha)

Dissemination

Strategy

Digital

Hard Copy

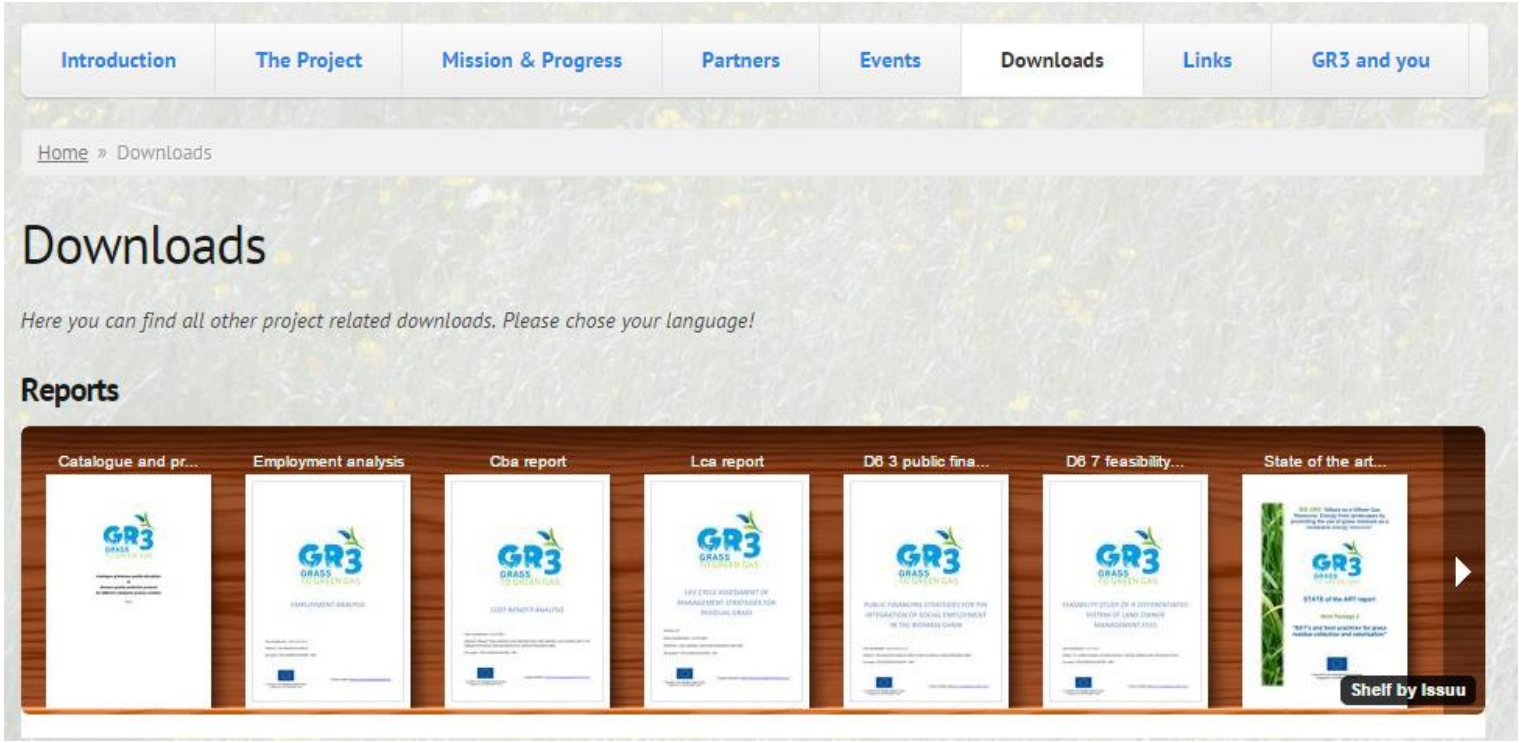
Final publishable reports
Manuals

Conferences

Participation
Regional conferences
Final open conference

Dissemination

Website : **www.grassgreenresource.eu**



Dissemination

Website : **www.grassgreenresource.eu**

Statistics (nov 2015):

- Users : > 7000 (>9400 sessions / 25% returning visitor)
- Actual Downloads (Top 3):
  - SOTA report: > 150
  - LCA report : > 45
  - Inventarisation Region reports : > 25
- Language :
  - **English : 49 %**
  - German : 8,7 %
  - Dutch : 7,9 %
  - Italian : 11,5 %
  - Danish : 4 %
  - Portuguese : 5,5 %

Dissemination

Electronic newsletters

6 newsletters
Information on publications & events
Seperate invitations for events
> 2 000 addressees
± 15 % opened newsletters (1st day)

Dissemination

Final Publishable Report

Distributed to attendees of (regional) & final conferences (225 copies)
(some mailed afterwards)

Dissemination

Conferences

EXTERNAL CONFERENCES
Active participation in **over 85 events**
Poster or presentation

FINAL REGIONAL CONFERENCES
Italy : 62 Participants (05/02/2016)
Denmark : 62 Participants (02/03/2016)
Germany : 16 Participants (23/02/2016)
Portugal : > 100 participants (14/03/2016)

FINAL OPEN CONFERENCE
Ghent : 17/03/2016 - > 70 participants
Joint with FP7 - INEMAD

Conclusions

- Grass digestion has a positive impact on the environment and the economies of the proces chain
- **Legislation** is complex and should be made clearer
- **Economies** are important (everything?) for involved stakeholders
    - "Competition" with leaving on-site = impossible
    - Biogas plant will ask for a gate fee for processing the material (= waste)
- Impact from availability other (better) waste streams (BE, DK)
- Impact from legislation (IT, D, PT)
- Stop expansion of the biogas sector (D, B, IT vs. DK)
- Lot of interest from **policy makers**

Partners & Contact

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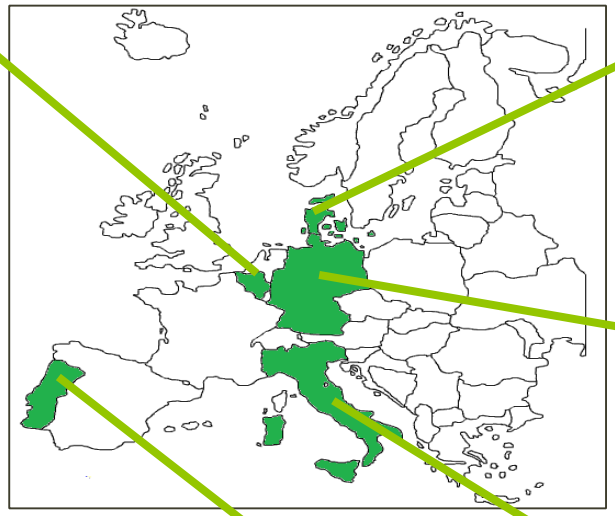

Denmark

University of Southern Denmark

Germany

IBBK

izes gGmbH Institut für ZukunftsEnergieSysteme

Portugal

LNEG Laboratório Nacional de Energia e Geologia, I. P.

Italy

Università degli Studi di Verona

Veneto Agricoltura Azienda Regionale per i settori Agricolo, Forestale e Agro-Alimentare