

15 September 2016

# Webinar: Matching Biomass and Conversion Technologies with Bio2Match

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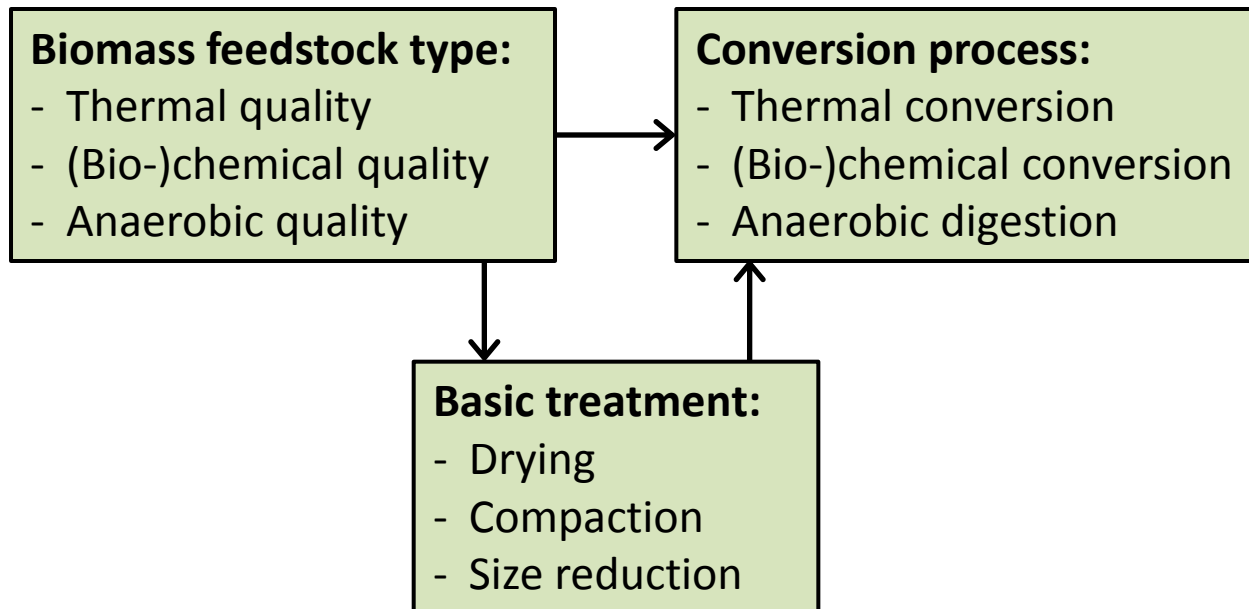


- Introduction
- Tool methodology and matching indicators
- Databases underlying the tool
  - Technology database
  - Biomass properties database
- Using the tool
- Bio2Match demonstration
- Questions, feedback, discussion



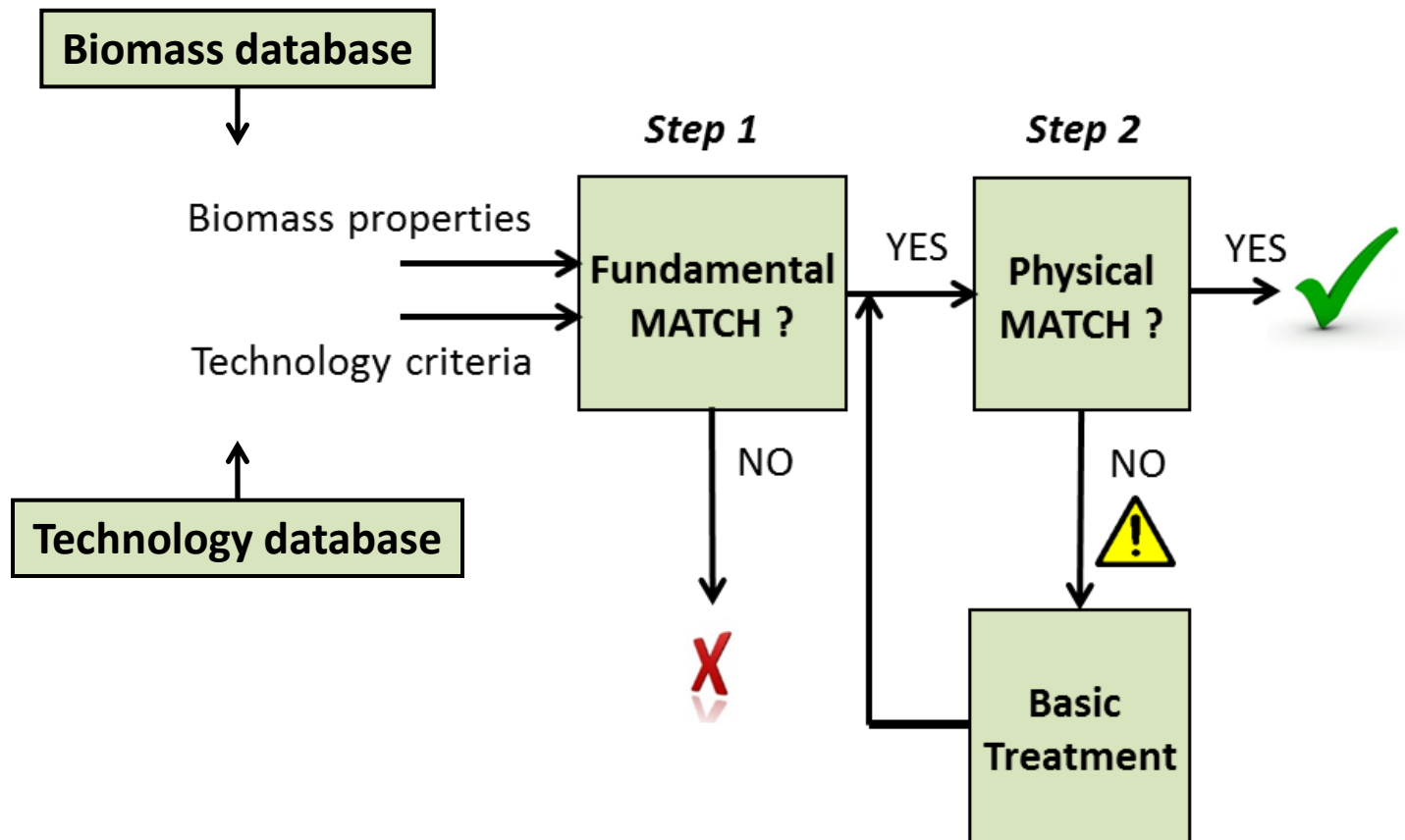
- Different regions...
  - Supply different types of biomass with different characteristics
  - Demand different products
- How to optimize the resource-efficient use of biomass at EU level?
- Goal: support stakeholders in the bio-economy with a matching tool.

- Biomass and technology matching, classification system:



- Distinction between ‘fundamental’ and ‘easy to modify’ properties.

- Biomass and technology matching, methodology:



## Quality indicators used for matching biomass and technologies:

- **Fundamental properties:**

- **Thermal:**
  - Chlorine content (corrosion)
  - Ash deformation temperature (slagging and fouling)
  - Ash content (product yield, processability, costs)
  - Nitrogen content (NO<sub>x</sub> emissions)
- **(Bio-)chemical:**
  - Cellulose + hemicellulose content (product yield)
  - Lignin content (processability)
  - Ash content (processability, costs)
- **Anaerobic digestion:**
  - Biogas yield (product yield)
  - Application of digestate possible (costs)

- **Physical properties:**

- **All:**
  - Moisture content (product yield, processability)
  - Bulk density (processability)

Classification of each quality indicator for the matching tool, using ranges:

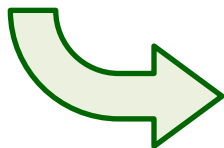
- Biomass properties:
  - Class 1: ideal biomass (e.g. very low ash content: < 1 wt-%)
  - Class 2: desirable biomass (e.g. low ash content: 1 - 3 wt-%)
  - Class 3: undesirable biomass (e.g. high ash content: 3 - 10 wt-%)
  - Class 4: very undesirable biomass (e.g. very high ash content: > 10 wt-%)
- Technology criteria:
  - Property X (e.g. ash content): Able to handle biomass of classes 1-2
  - Property Y (e.g. chlorine content): Able to handle biomass of classes 1-4
  - Property Z (e.g. carbohydrate content): Able to handle biomass of class 1
- In this way you can see if there is a match (or why not) and if a technology could perhaps use lower quality biomass as well.

s2biom.alterra.wur.nl/web/guest/conversion

Biomass chain data / Conversion technologies

- Direct combustion of solid biomass
- Gasification technologies
- Syngas platform
- Fast pyrolysis
- Torrefaction
- Treatment in subcritical water
- Techniques from pulp & paper
- Chemical pretreatment
- Biochemical hydrolysis
- Fermentation to ethanol and bio-based products
- Anaerobic digestion

Select a technology to view the details



Biomass chain data / Conversion technologies

My Sites Tjts Lammens

## View details of BFB for syngas

**GENERAL PROPERTIES**

Name: BFB for syngas  
 Main category: Gasification technologies  
 Subcategory: Bubbling fluidized bed for syngas production  
 Image url:  
 Year of first implementation:  
 Estimated number of systems in operation:  
 Main operating principle:  
 Biomass is gasified with steam and oxygen at pressurised BFB gasifier operated at ca. 8 bar and 870 C. Product gas is cooled to 600 C, filtered and led into catalytic reformer where tars and hydrocarbon gases are reformed. Then product gas is cleaned, conditioned and pressurised to fuel synthesis.

Level of commercial application: Important pilots and EU projects  
 Expected Developments: Current Technology Readiness Level in 2014: Level 7, Integrated pilot system demonstrated  
 Expected Technology Readiness Level in 2030: Level 9, System ready for full scale deployment  
 Justify expected Level in 2030:  
 References: Carbona/Andritz

**TECHNICAL PROPERTIES**

Capacity of outputs (typical values)

Heat (MWh) 45	typical: 0.15	min: 0	max: 0.2	typical in 2020: 0.1	typical in 2030: 0.1
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Conversion efficiencies: net returns heat(GJ/GJ biomass input)

Methanol Conversion efficien

Data sources used t  
 VTT Technology 91,  
 large-scale fluidised-  
 VTT Technology; 91  
 External inputs (not  
 Power (kW): 5

Indication: experien

Number of possible  
 Number of typical fu  
 Typical Lifetime of E

Biomass input, com  
 Biomass input, techn

Traded fom Woc  
 Dimensions P31

Moisture content  
 Minimal bulk density  
 Maximum ash conte  
 Minimal ash melting  
 Volatile matter (only  
 exploded)

Maximum allowable  
 Nitrogen, N (wt%, dr

Investments costs	in 2014 (€): 500000000	expected in 2020 (€): 350000000	expected in 2030 (€): 350000000	Labour needed	Operators (FTE): 25	Staff and engineering (FTE): 20
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Edited by: Janne Käarki, Hamid Mozaffarian

### Database contains (a.o.):

- Description of main operating principle
- Level of commercial application
- Technology Readiness Level
- Type and capacity of product output
- Conversion efficiencies
- Investment costs
- Labour requirement
- Feedstock quality criteria



- Database prepared by experts from within the consortium, based on literature, containing 50 entries in the following categories:
  - Forestry biomass:
    - Primary forestry products
    - Primary forestry residues
  - Agricultural biomass:
    - Primary production of lignocellulosic crops
    - Agricultural residues
    - Grassland
  - Other land use:
    - Biomass from landscape maintenance
    - Biomass from roadside
  - Industrial residues:
    - Secondary residues of wood industries
    - Secondary residues of industries using agricultural products
  - Consumer waste:
    - Biodegradable municipal waste
    - Post-consumer wood
- Database contains typical, high and low values on the matching indicators.

# Using Bio2Match

### Select rows and columns

Switch rows and columns

#### Columns - Biomass types

- Production from forests
- Primary residues from forests
  - Primary production of lignocellulosic bi...
- Agricultural residues
  - Rice straw
  - Cereals straw
  - Oil seed rape straw
  - Maize stover
  - Sugarbeet leaves
  - Sunflower straw
- Grassland
- Other land use
- Secondary residues from wood industr...
  - Bark residues from pulp and paper...
  - Black liquor
  - Residues industries producing sem...
  - Residues from further woodproces...
  - Sawdust from sawmills from conifers
  - Sawdust from sawmills from nonco...
  - Sawmill residues: excluding sawdus...
  - Sawmill residues: excluding sawdus...
- Secondary residues of industry utilisin...
- Municipal waste
- Waste from wood

#### Rows - Conversion technologies

- Syngas platform
  - Syngas to FT-diesel (52)
  - Syngas to methanol (41)
  - Producer gas to biomethane (44)
- Gasification technologies
- Direct combustion of solid biomass
- Anaerobic digestion
  - Complete mix digester state of the ...
  - Dry Batch Digestion (MSW) (35)
- Biochemical treatment
  - Kraft process with Lignoboost (16)
  - Prehydrolysis kraft (17)
  - Ethanol from lignocellulose (dilute a...
- Torrefaction
- Treatment in subcritical water
- Fast pyrolysis
  - Pyrolysis oil diesel (40)
  - Fast pyrolysis + Multiple diesel com...
  - Fast pyrolysis + CHP plant, value ch...
  - Fast pyrolysis + Industrial steam bo...
  - Agricultural residues to pyrolysis oil...
  - Fast Pyrolysis of residues + Boiler fo...
  - Fast pyrolysis of residues + CHP pla...
  - Wood chips to pyrolysis oil (23)
  - Fast pyrolysis + Boiler for heat, valu...

### Match

Name ↑	Thinnings from conifer trees	Cereals straw	Bark
Agricultural residues to pyrolysis oil (24)	✓	✓	✓
Complete mix digester state of the art 2014 (2)	✗	✓	✗
Ethanol from lignocellulose (dilute acid pretreatment...)	✗	✓	✗
Grate boiler with agrobiomass for CHP (73)	⚠	✓	⚠
Grate boiler with wood chips for CHP (30)	✓	✗	⚠
Syngas to methanol (41)	⚠	✗	⚠

#### Matching overview for biomass type "Cereals straw" and conversion "Grate boiler with wood chips fo..."

Name	Group	Match
Ash content	Thermal conversion	✓
Ash melting behavior (DT)	Thermal conversion	✗
Bulk density, BD	Physical treatment	⚠
Chlorine content	Thermal conversion	✗
Moisture content	Physical treatment	✓
Nitrogen content	Thermal conversion	✓

### Matching characteristics

- Anaerobic digestion
- Biochemical treatment
- Physical treatment
- Thermal conversion

### Product groups

- electricity
- biofuels and biobased products
- heat

### Regions

- Italia
- France

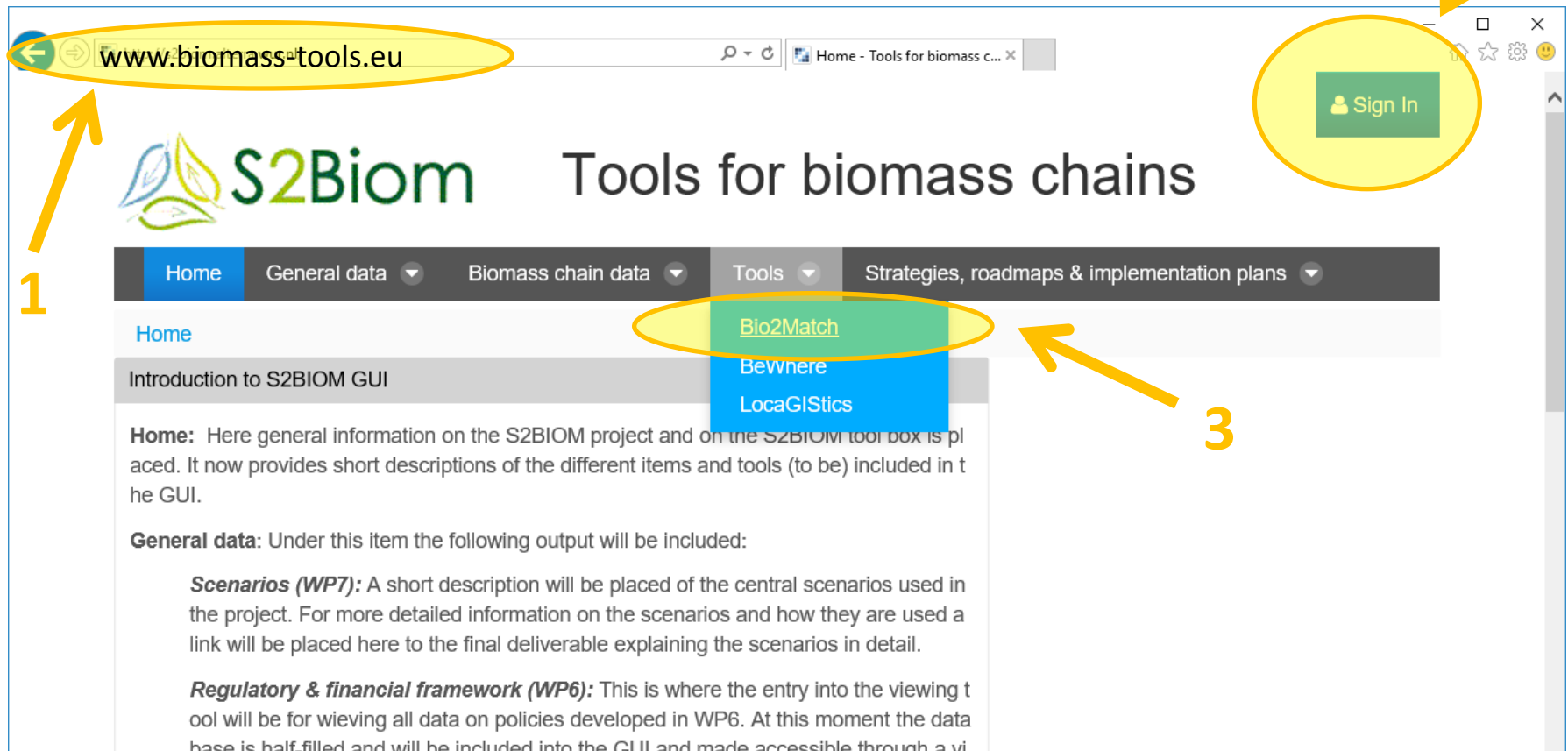
  

### Legend

- ✓ Physical match
- ⚠ Fundamental match, no physl...
- ✗ No match
- ⊖ Not taken into consideration
- 🔧 Missing data

# Work with Bio2Match

1. Go to [www.biomass-tools.eu](http://www.biomass-tools.eu).
2. Sign in, using: screen name 'demo' and password 'helsinki'.
3. Click on 'Tools' – 'Bio2Match'.

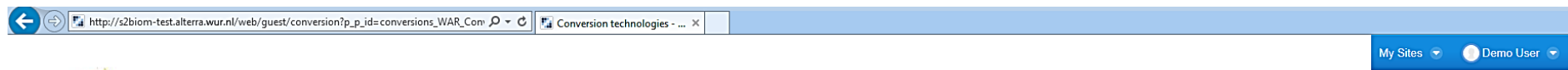


The screenshot shows the S2Biom website interface. The browser address bar contains the URL [www.biomass-tools.eu](http://www.biomass-tools.eu). The page header includes the S2Biom logo and the text "Tools for biomass chains". A navigation menu is visible with options: Home, General data, Biomass chain data, Tools, and Strategies, roadmaps & implementation plans. The "Tools" menu is expanded, showing options: Bio2Match, BeWhere, and LocaGISTICS. The "Bio2Match" option is highlighted. A "Sign In" button is located in the top right corner. The main content area includes a "Home" section with an introduction to the S2BIOM GUI and a "General data" section with information about scenarios and regulatory frameworks.

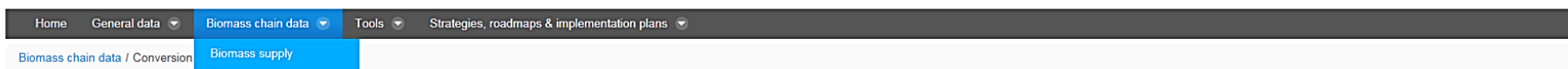
# Work with Bio2Match



1. The technology database can be accessed in 'biomass chain data'.
2. Click on 'Category' to alphabetically order the technologies by category.
3. Click on the 'view' icon to access the information about that technology.



## S2Biom Tools for biomass chains



**Conversion technologies (WP2)**  
This item in the GUI gives access to a comprehensive amount of characteristics on a large number of biomass conversion technologies collected in WP 2. Currently the access to this database is simple and provides more of a scrolling function through all records specified so far. In the near future a tool will be further developed and visualized to provide an interactive overview of the main technical, economic and GHG emission parameters of current and future pre-treatment and conversion technologies through selections specified by the user. The data included in this database will also be the basic data feed for the assessment tools which are made accessible under the 'Tool' item in the GUI.

The conversion technology types included in this database can be classified as:

- Thermal conversion processes
- Chemical conversion processes
- Bio-chemical conversion processes
- (Biobased) products/building blocks

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At this moment a great deal of technologies have already been included, particularly those which have reached a mature technology level, but more technologies will follow including those which have not yet reached a mature technology levels. Information on biobased building block technologies will also be covered to the extent possible within the time and budget limitations of the project.

Conversion technologies

75 Items per Page | Page 1 of 1 | Showing 51 results.

2

Number	Category	Subcategory	Name	Output capacity	Common biomass input	Additional input	Last edited	
75	Direct combustion of solid biomass	Fixed bed combustion for heat	Grate boiler with straw for heat	Heat	Rice straw		Tijs Lammens	
74	Treatment in subcritical water	Hydrothermal processing	HTC Hydrothermal carbonisation of biowaste to coal for CHP	Biocoal	Separately collected biowaste: Biodegradable waste of separately collected municipal waste (excluding textile and paper), Biowaste as part of integrally collected municipal waste: Biodegradable waste of not separately collected municipal waste (excluding textile and paper), Other industry by-products utilising agricultural products, Other by-products and residues from food and fruit processing industry	Power, Heat (useful, not process steam)	Klaus Lenz	
73	Direct combustion of solid biomass	Fixed bed combustion for CHP (steam cycle)	Grate boiler with agrobiomass for CHP	Power, Heat			Janne Kärki	
72	Fast pyrolytic	Pyrolytic plus boiler for	Fast pyrolytic of residues	Power, Heat			Tijs	

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← First Previous Next Last →

[www.biomass-tools.eu](http://www.biomass-tools.eu)

# Thank you for your attention!

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Property	Unit	Quality class			
		1	2	3	4
Chlorine content	wt-% d.m.	<0.02	0.02- 0.1	0.1- 0.4	>0.4
Ash melting temperature	°C	>1200	1000- 1200	800- 1000	<800
Ash content	wt-% d.m.	<1	1-3	3-10	>10
Nitrogen content	wt-% d.m.	<0.3	0.3-1	1-2.5	>2.5
Carbohydrates	wt-% d.m.	>65	50-65	30-50	<30
Lignin content	wt-% d.m.	<10	10-25	25-35	>35
Biogas yield	m <sup>3</sup> /ton a.r.	>300	150- 300	50- 150	<50
Digestate has an application		Yes			No