



**How to ensure efficient operation of
anaerobic digestion facilities**

Katja Lyons & Georgi Kirov

BIOGEST in short

BUSINESS UNITS

- **Biogas Engineering**
Design & Construction of biomethane and biogas plants
- **Own Plant Operation**
Shareholder & Operator of biomethane and biogas plants
- **Agriculture**
Sustainable Food Production

LOCATIONS

- **AT** (Vienna, Linz), **US** (Denver), **UK** (Carlisle), **FR** (Change), **CZ** (Breclav),
IT (Sgonico), **RO** (Timisoara), **RS** (Novi Sad)
- with **14 distributors worldwide**

75+

Employees

30+

Years
of Experience

170+

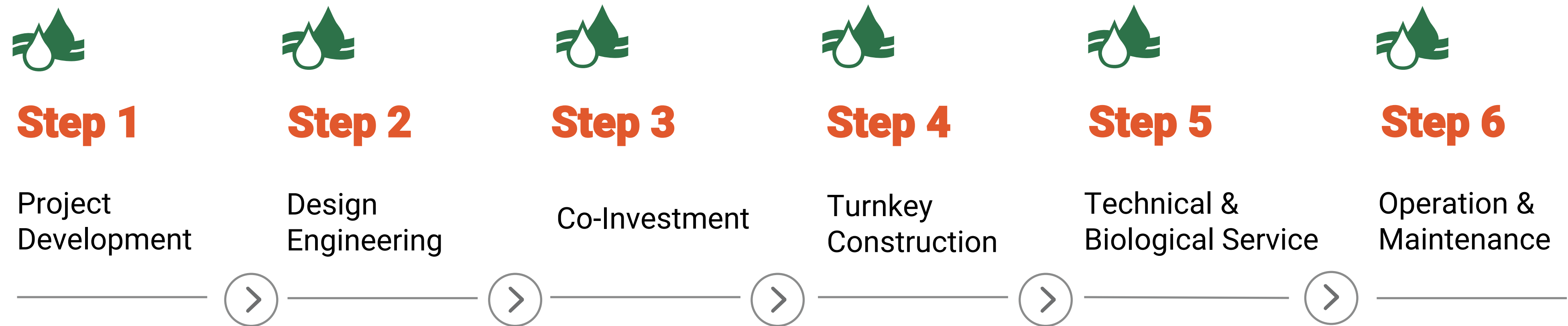
Completed
Projects

20+

Countries

What we can do for you

A reliable, straightforward & profitable all-in-one solution for biomethane & biogas plants.
Let us do the work!



PowerRing

The efficient Allrounder



PowerCompact

Plug and Play



PowerSPF

The reliable and economical solution



PowerDigest

The straightforward classical solution



Memberships

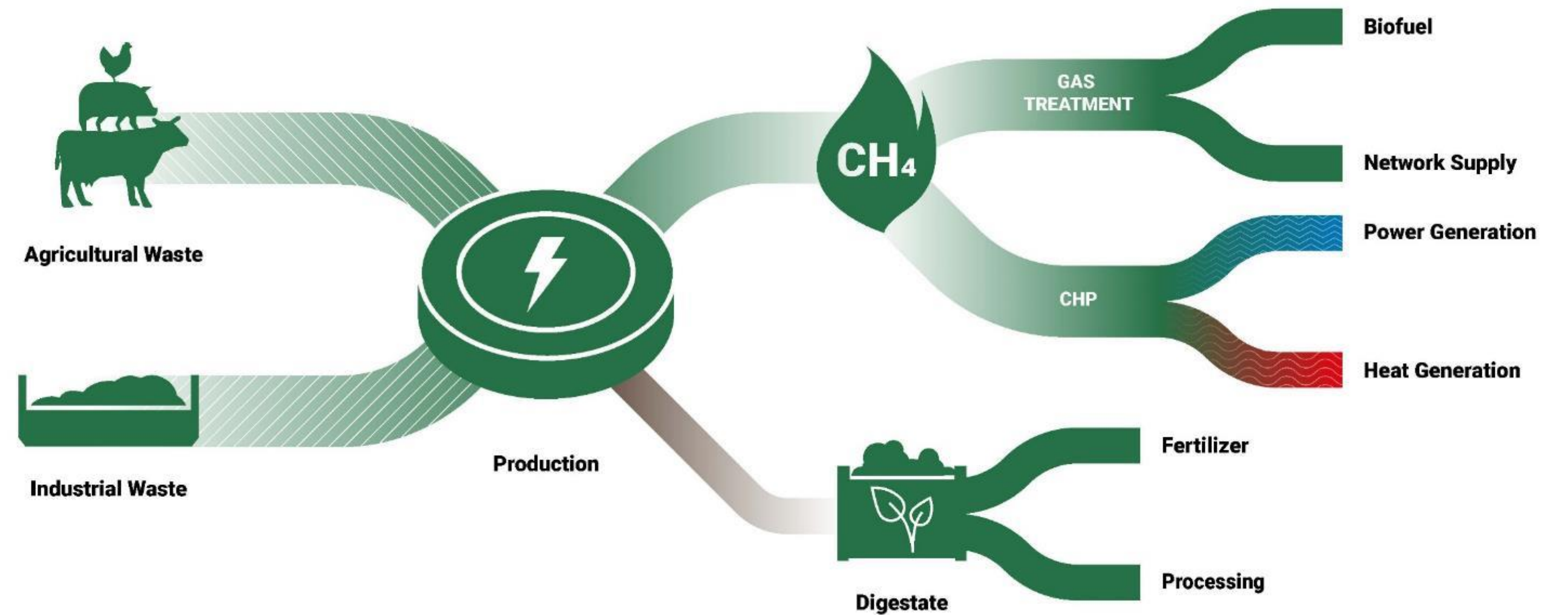
The below stated associations are an ideal platform for communication and collaboration between the actors in our sector, grounded in the benefits of a circular bio-economy.



Advantages of Biogas

Biogas can be used in a myriad of ways!

- Co-generation unit produces electricity or heat
- Constant biogas production and storage
- Covering both basic power demand as well as peak loads
- Decentralized heat and power generation
- Electricity can be fed into the grid in a decentralized and controlled manner, even under unfavorable network conditions



Advantages for Farmers

With a biomethane or biogas plant system on your farm, you will enjoy many advantages at once.

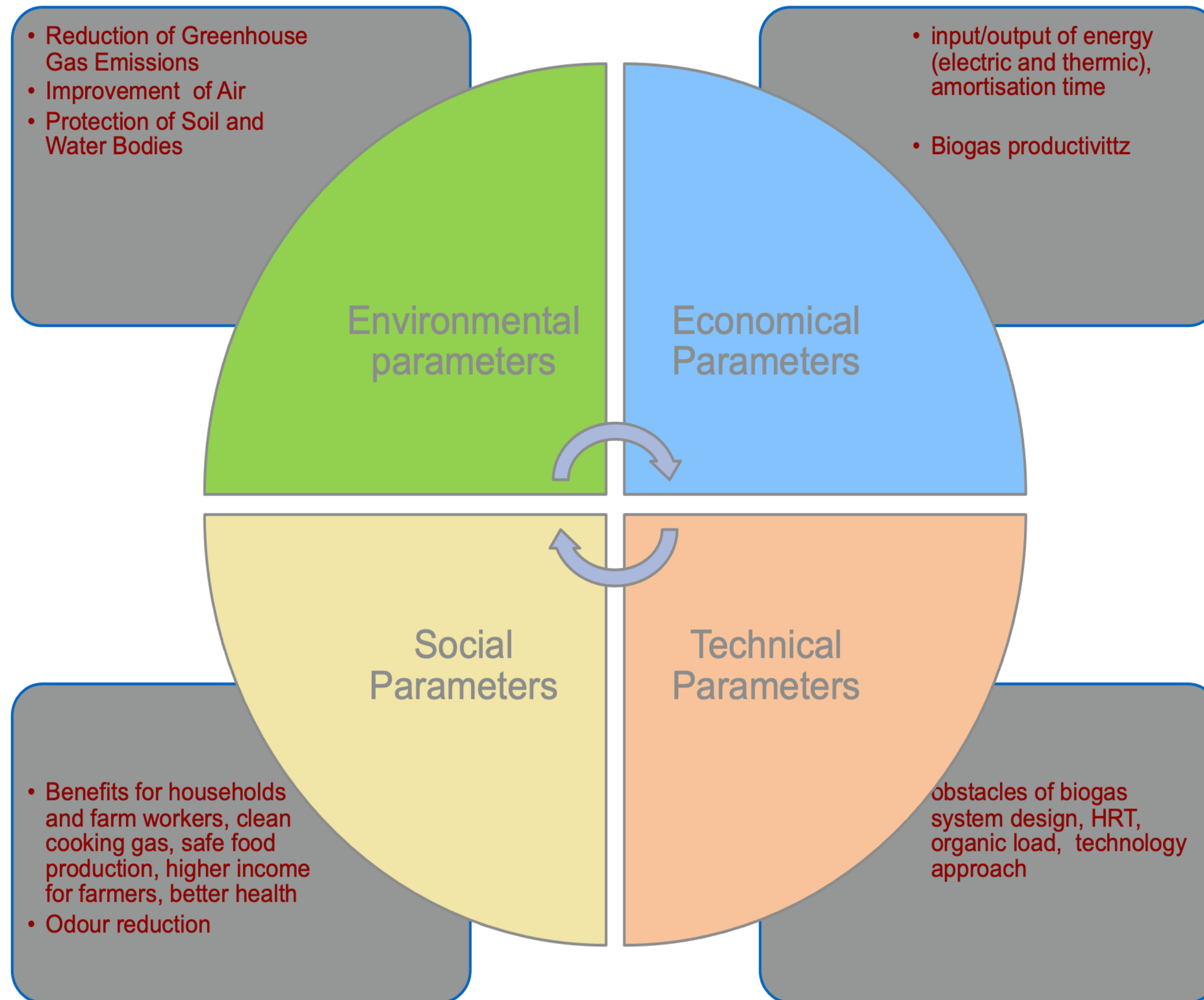
- Improvement of existing waste management
- **Methane capture from animal waste**
- Closed nutrient cycle by putting the digestate back on the fields
- **Clean environment** through efficient processing of waste
- Helpful to the environment as a whole
- **Save money on mineral fertilizer by producing your own organic fertilizer**
- Odor reduction
- Energy from biomethane/ biogas can be **generated 365 days a year** regardless of the weather
- Diversification of **farm income**/ additional revenue stream with existing resources

Waste management is both essential and expensive. Our efficient solutions help you to increase your income and allow you to produce your own organic fertilizer.

Requirements for efficient operation of anaerobic digestion facilities

1. Legislation
2. Incentives / income
 - feeding tariff for electricity, biomethane injection or gate fee
 - carbon reduction and utilisation of organic waste
 - organic fertilizer market
3. Feedstock availability/quality and feedstock logistics
4. High-quality equipment and best-of-class AD technology with high feedstock and dry matter flexibility
5. Low energy consumption of the technology
6. Simple service and maintenance
7. High-performance numbers (AD plant availability)

Key parameters



Requirements for efficient operation of anaerobic digestion facilities

Legislation

1. Emission Legislation - critical values, methane slip etc.
2. Agricultural Legislation - fertilizer legislation (digestate use)
3. Building/Construction Legislation - requirements for permission, requirements for further extension
4. Financial legislation - taxes
5. Safety legislation – workers, environment

- The DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources (recast) – further referred to as „RED II” stipulates the „Sustainability and greenhouse gas emissions saving criteria for biofuels, bioliquids and biomass fuels” in Article 29
- **The emission savings from the use of biofuels, bioliquids and biomass fuels ... shall be at least 65 % for biofuels, biogas consumed in the transport sector produced in installations starting operation from 1 January 2021**
- **“for biomass fuels used as transport fuels the fossil fuel comparator EF(t) shall be 94 g CO₂eq/MJ”.**

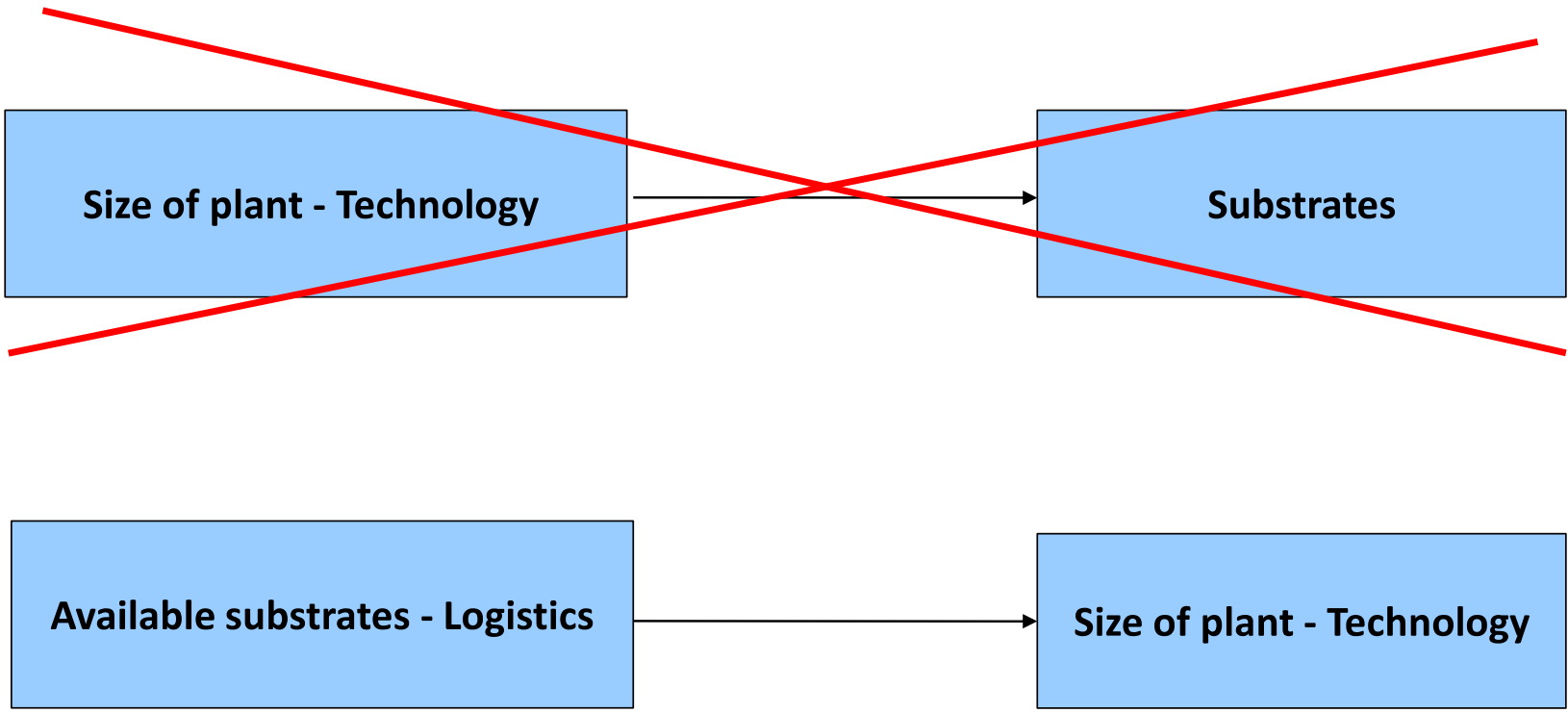
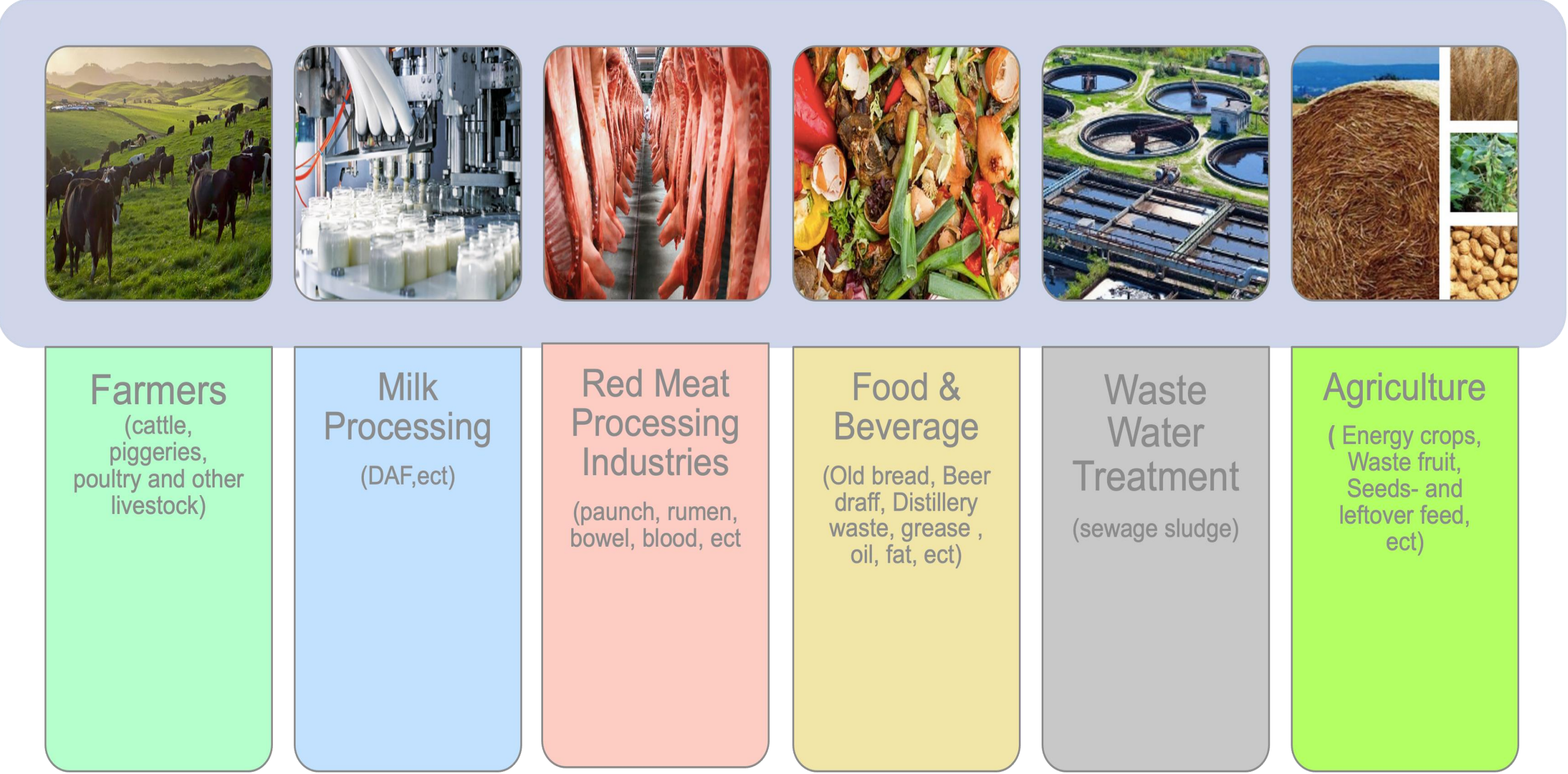
Requirements for efficient operation of anaerobic digestion facilities

Incentives / income

1. Feeding tariff for electricity or biomethane injection
 - example electricity sales in France 0,25ct/kwh
 - example biomethane sales in France 90€/mWh
2. Carbon reduction and utilisation of organic waste – up to 30% government subsidies
3. Organic fertilizer market – example India or Europe – 300 to 600 €/t vs. Australia currently 1300 -1400 \$/t for synthetical fertilizer

Requirements for efficient operation of anaerobic digestion facilities

Feedstock availability



Requirements for efficient operation of anaerobic digestion facilities

Feedstock quality and biogas potential

Methane Yield	m ³ Biogas/ kg oDM
Protein	0,6-0,9
Fat	0,9-1,4
Carbon hydrates	0,7-0,8

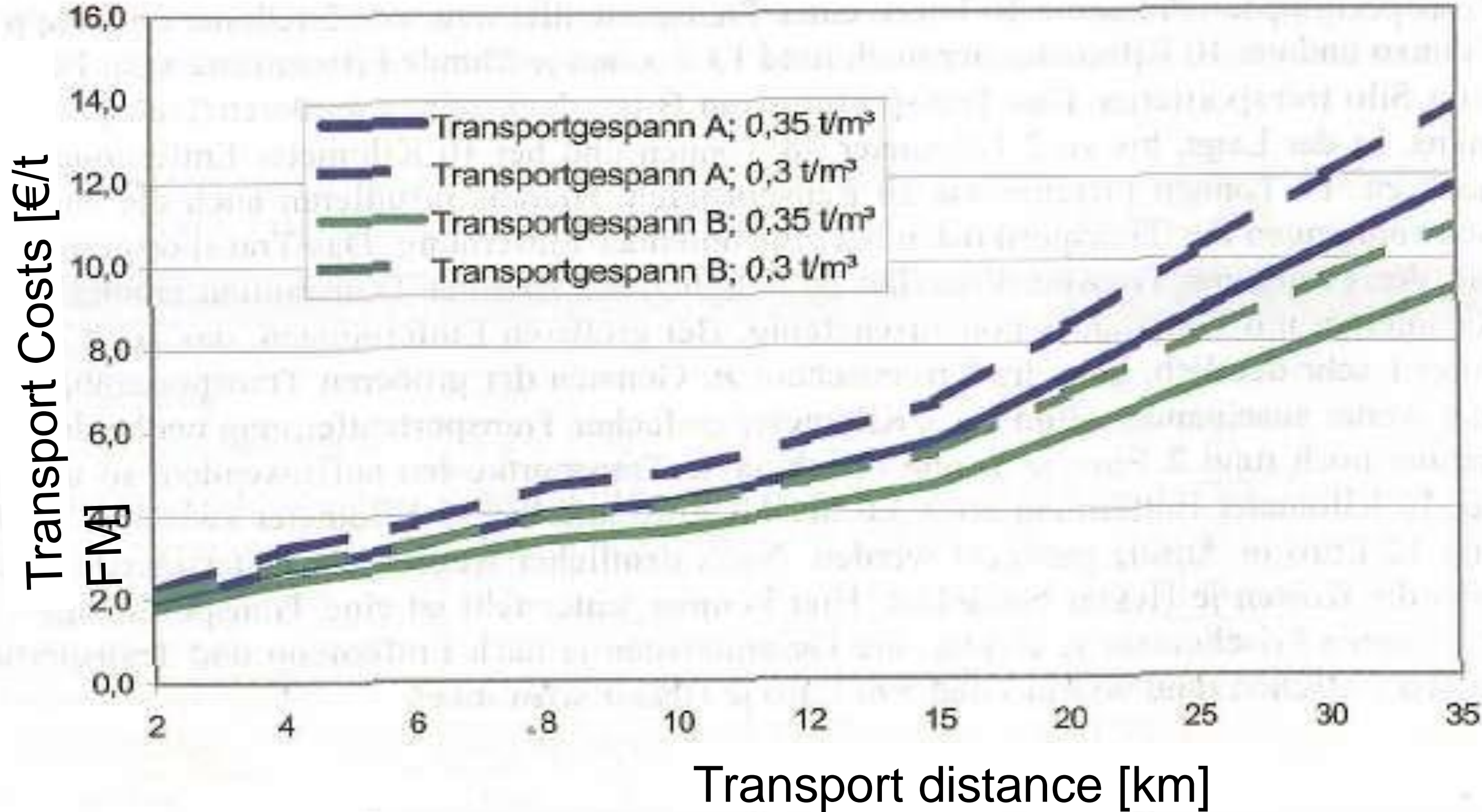
Substrate	DM (%)	Biogas [m ³ /t FM]	Methane [vol%]	Methane [m ³ /tFM]
Cattle slurry	10	25	55	14
Cattle manure	25	80	55	44
Corn Silage	33	200	52	108
Gras Silage	35	180	53	95
Biowaste ¹	20 ²	120	60	72

Requirements for efficient operation of anaerobic digestion facilities

Feedstock logistics

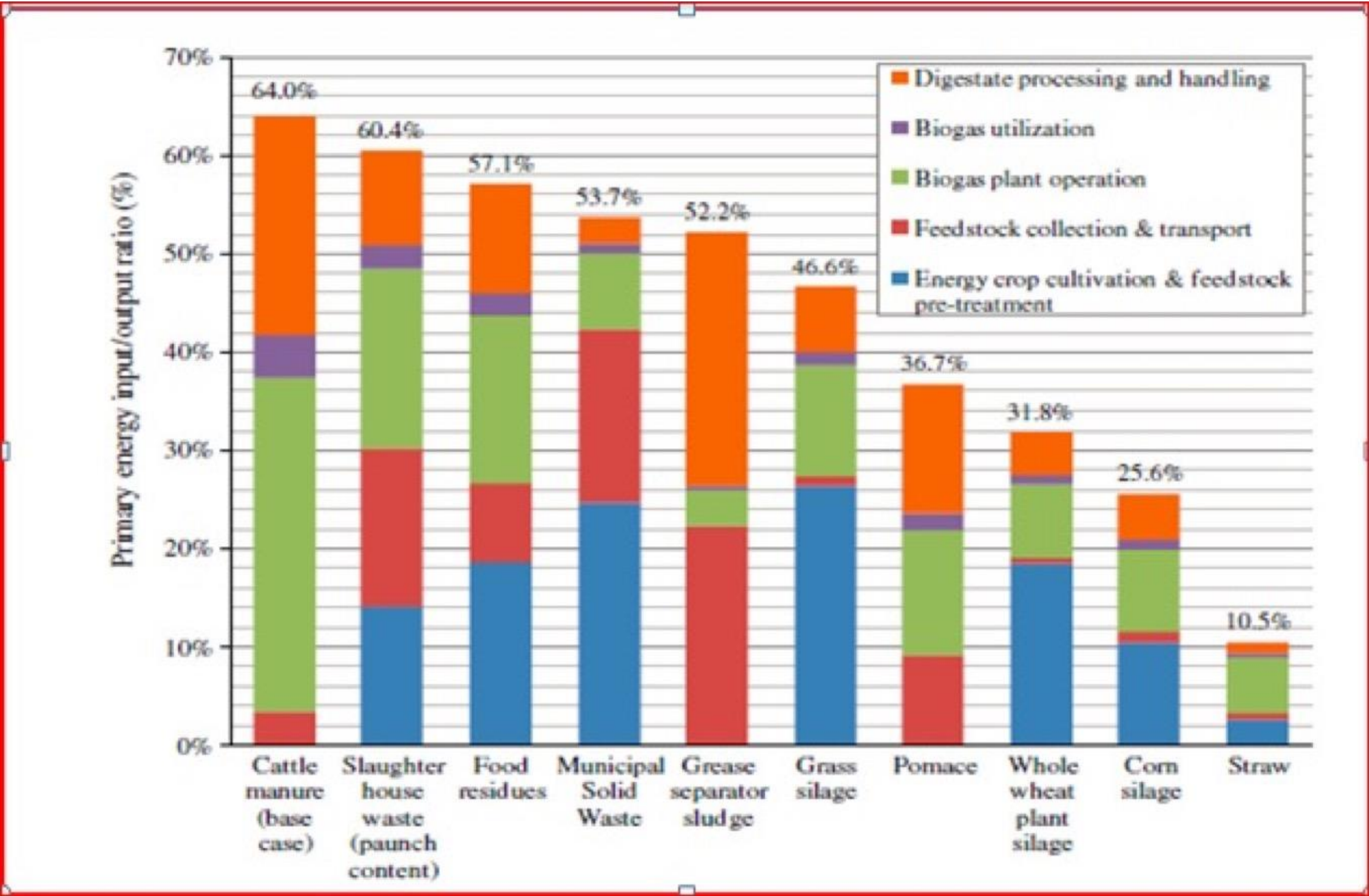
Transport distance (under German conditions)

- Slurry < 5km
- Energy crops < 12-15km (max. 20km)



Requirements for efficient operation of anaerobic digestion facilities

Feedstock balance

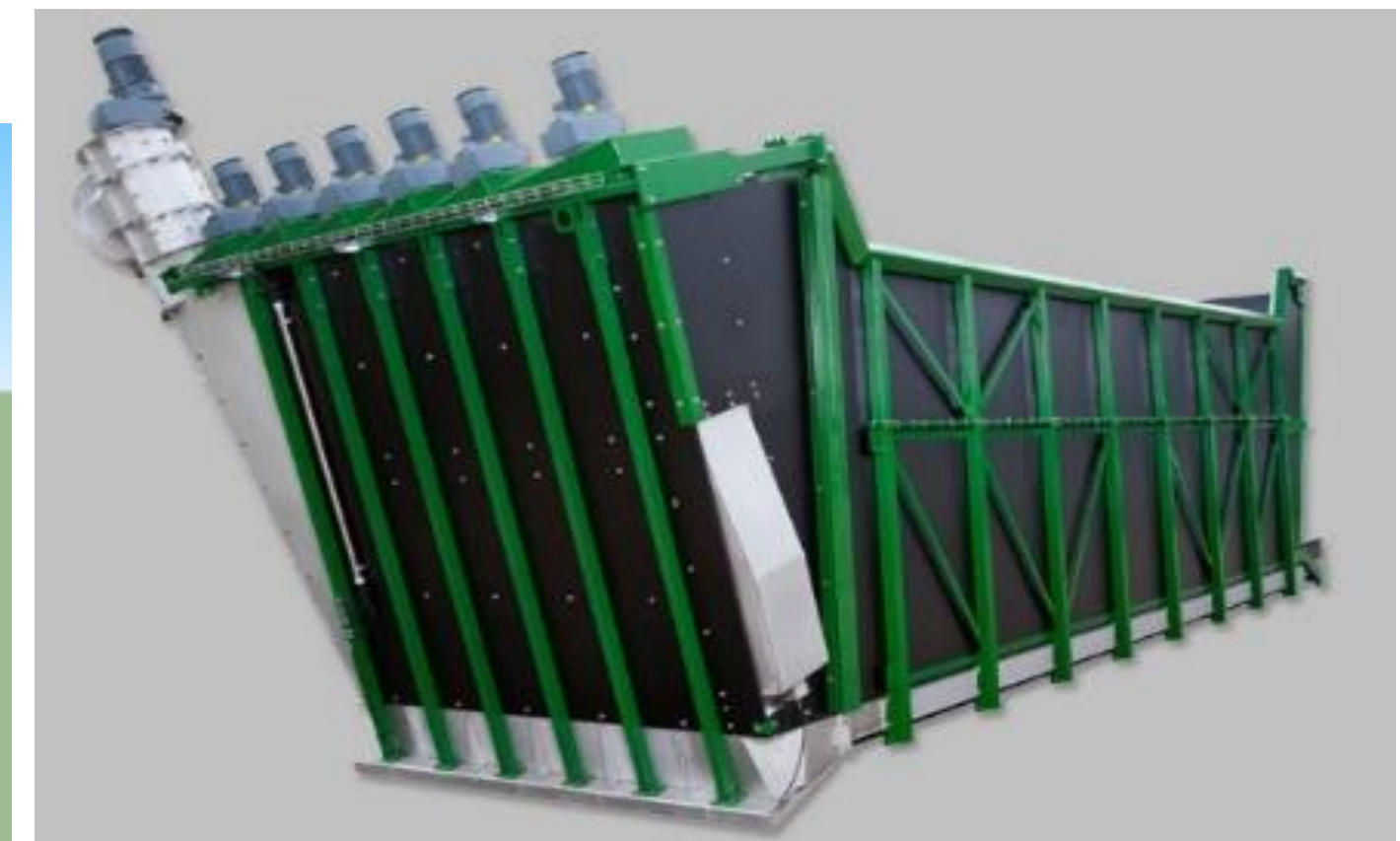
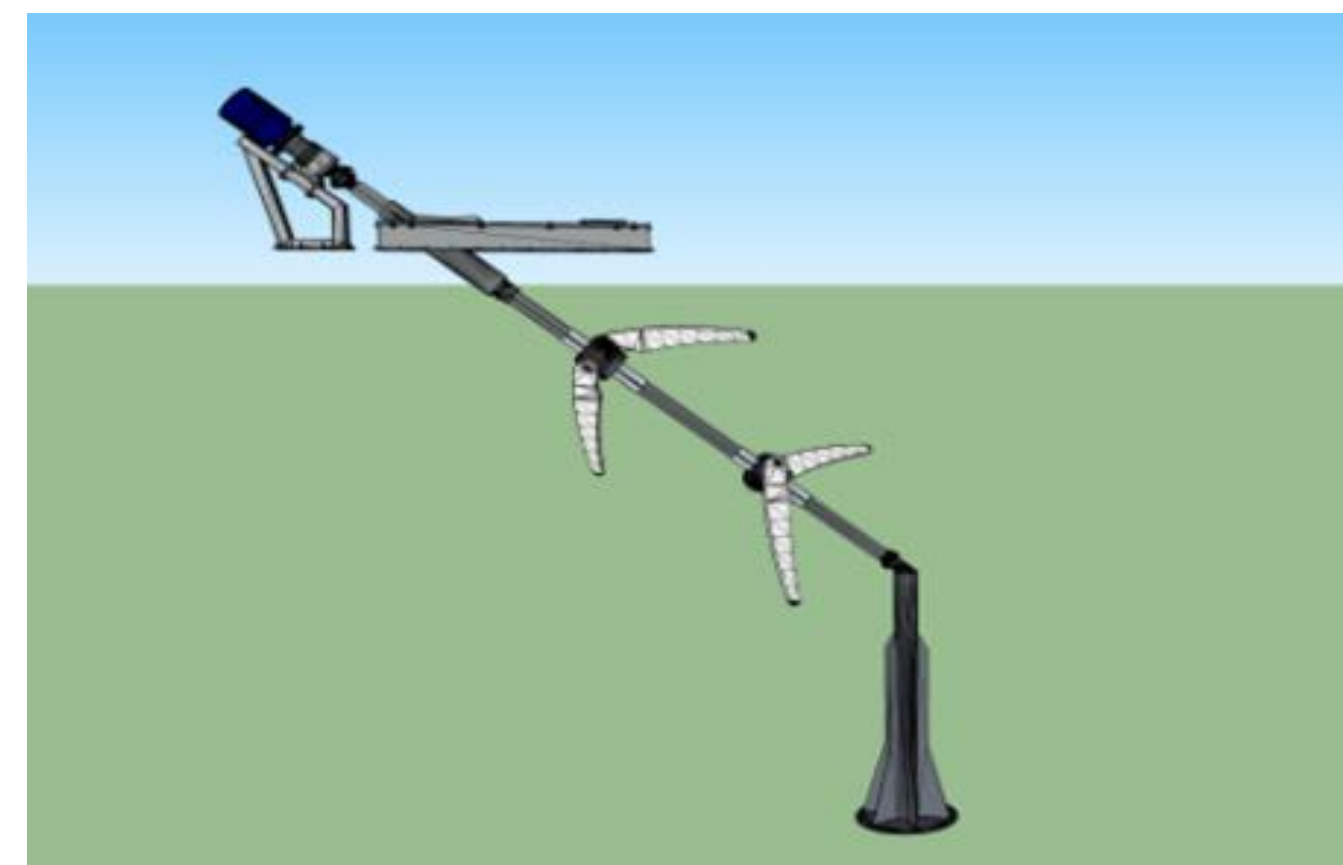
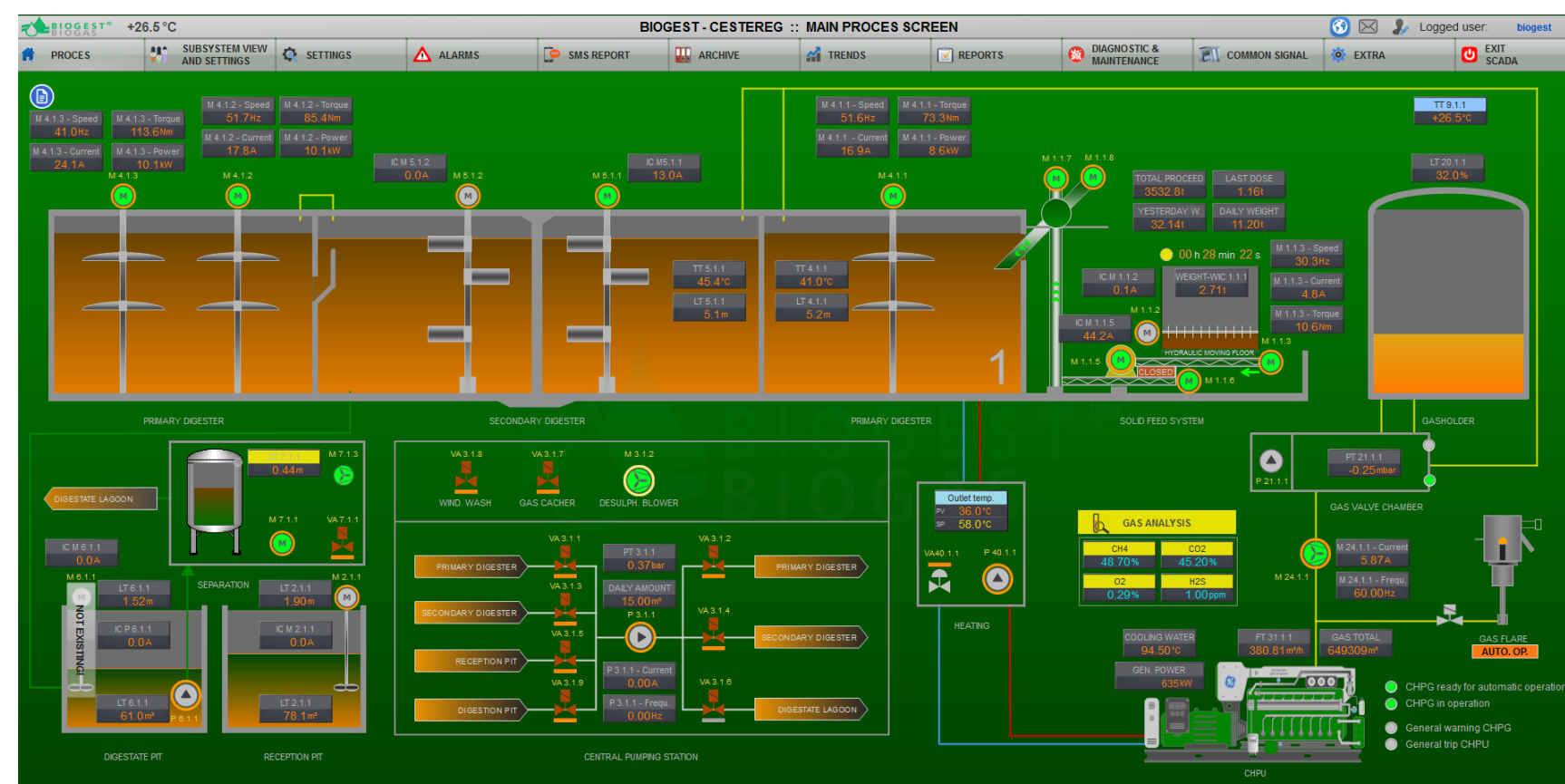


Requirements for efficient operation of anaerobic digestion facilities

High-quality equipment and best-of-class anaerobic digestion technology with high feedstock and dry matter flexibility

For agriculture and industry the following categories can be defined:

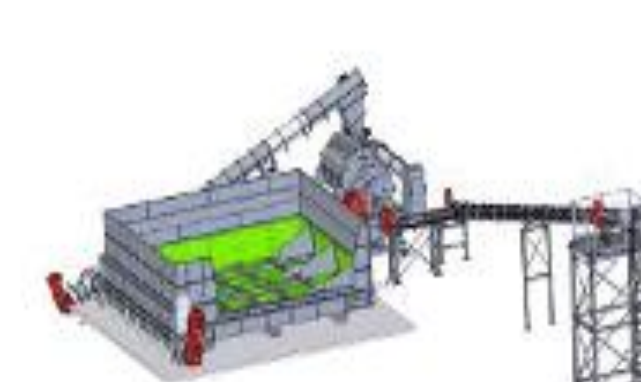
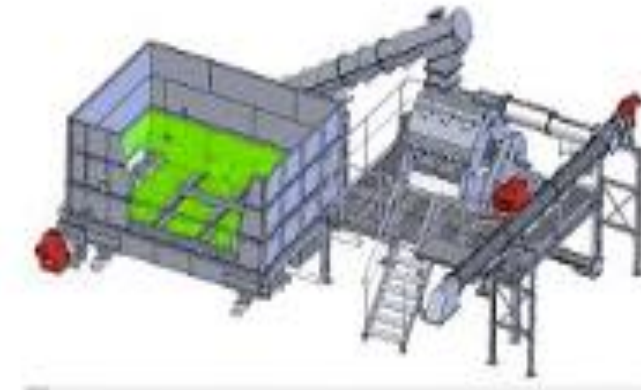
1. Digester Tower in Waste Water Treatment Plants
2. High-Performance Systems for Industrial Waste Water
3. Biogas Plants used in Agriculture for manure and energy crops
4. High-Performance Two-Step Biogas Plants liquid & solid Organic Waste
5. The so-called Dry-Fermentation for the solid but moist waste fractions
6. Lagoon Biogas Plants



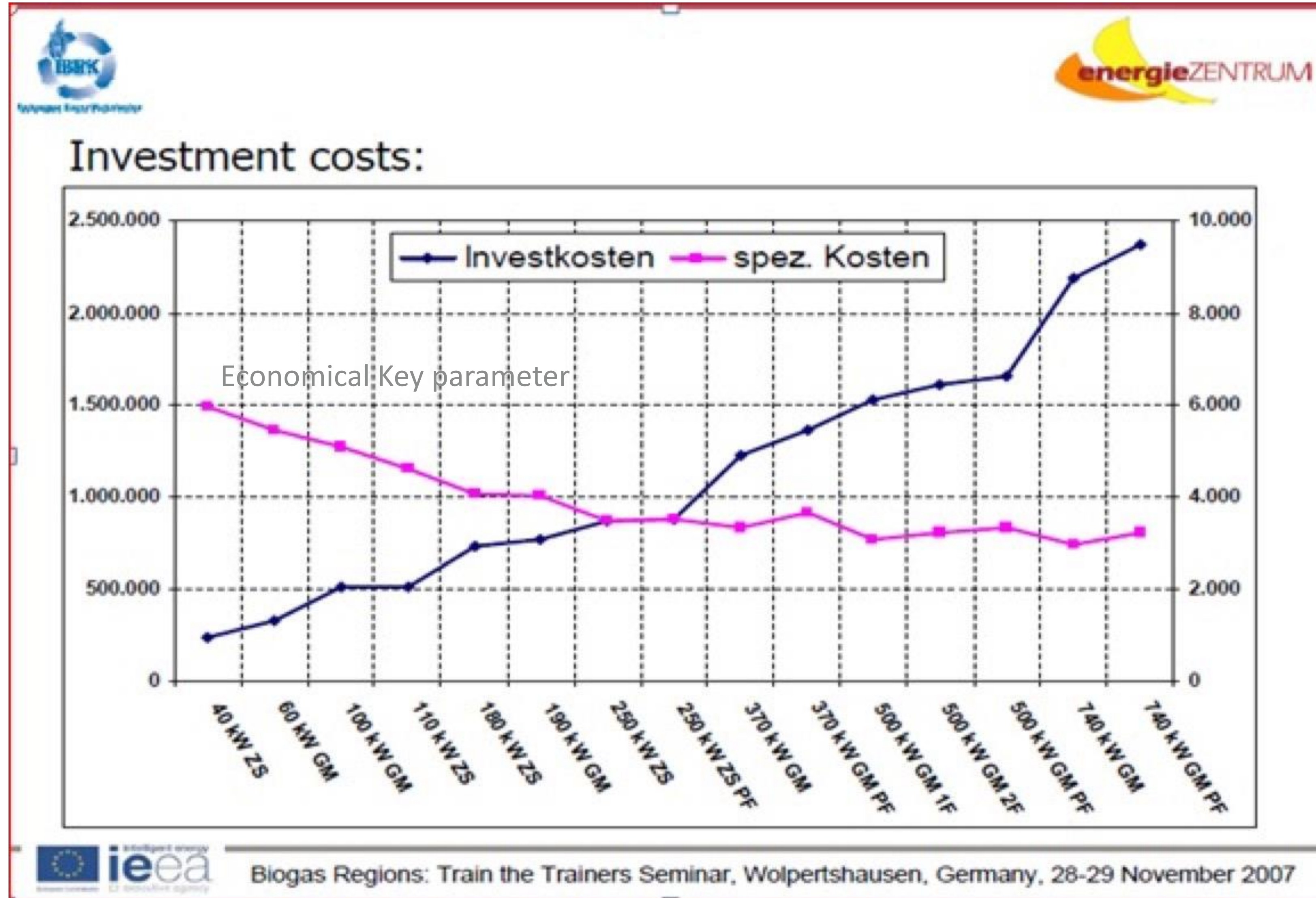
Requirements for efficient operation of anaerobic digestion facilities

Food & Agricultural waste

References in CZ, Bulgaria and Greece, Croatia, Japan, Israel, etc



Economical Key parameter- Investment costs

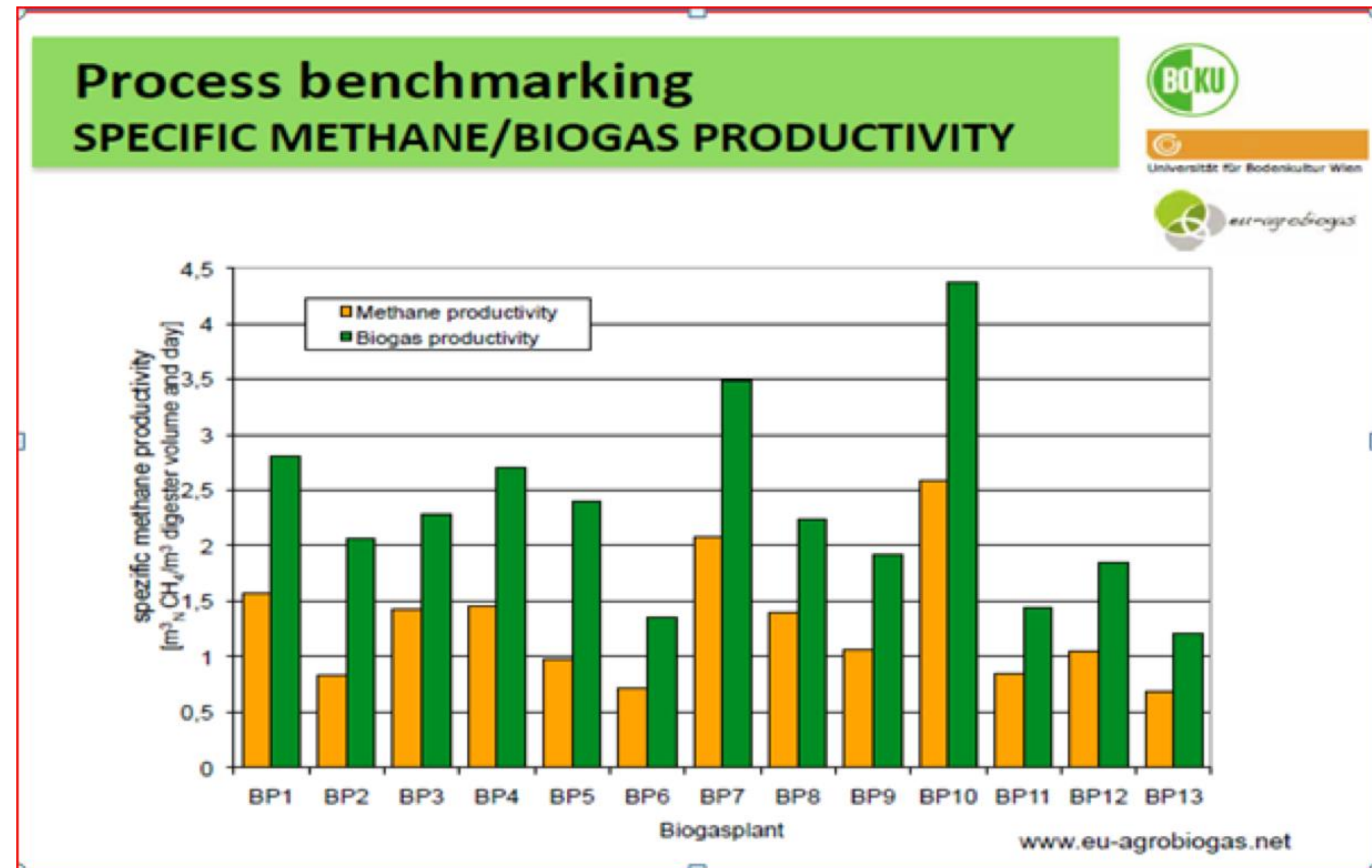


Biogas productivity –The economical key parameters

Biogas productivity (=daily m³ biogas volume / m³ fermenter volume)

A min. ratio of 1:1 !!!

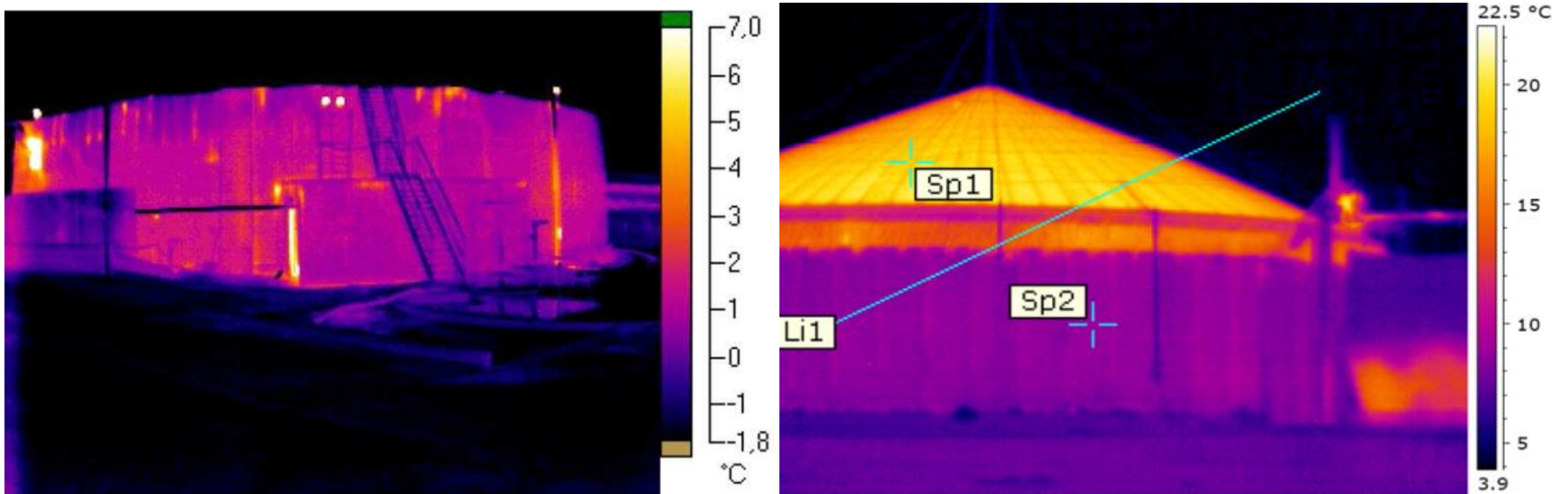
Optimization possible → monitoring systems, substrate optimization, feeding systems, process optimization and benchmarking



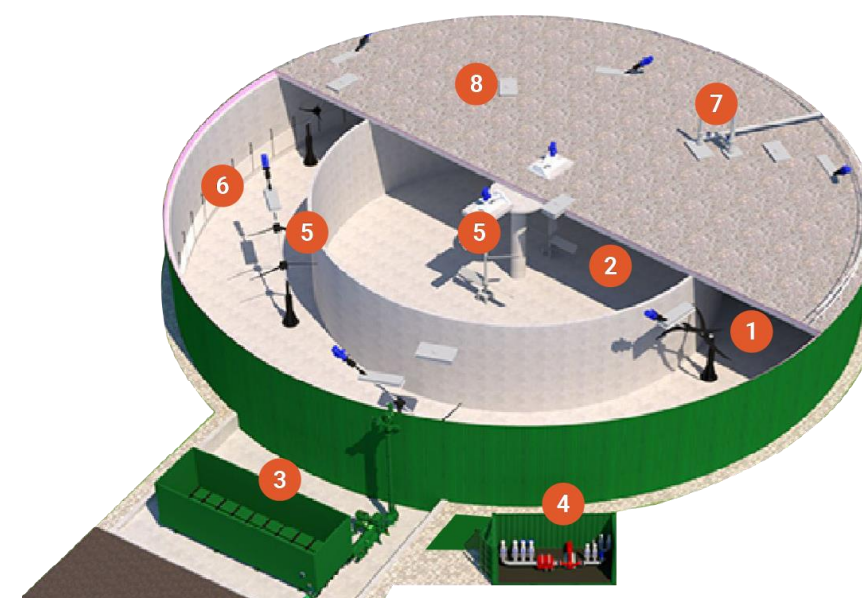
Optimization not only depends from substrate composition but also need good operation!! Energy and money can be saved through efficient single unit operation!

Requirements for efficient operation of anaerobic digestion facilities

Low Energy consumption of the technology

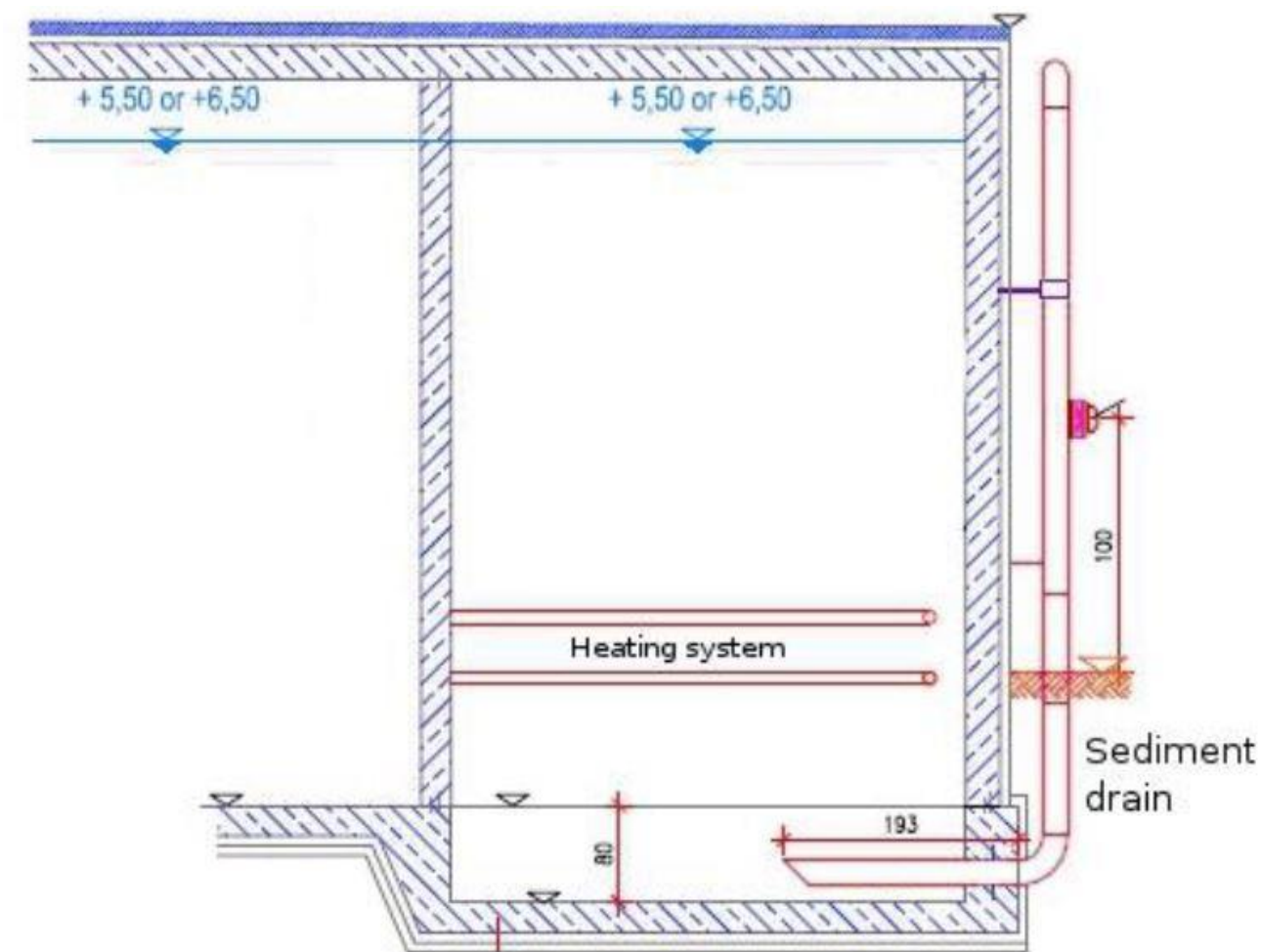
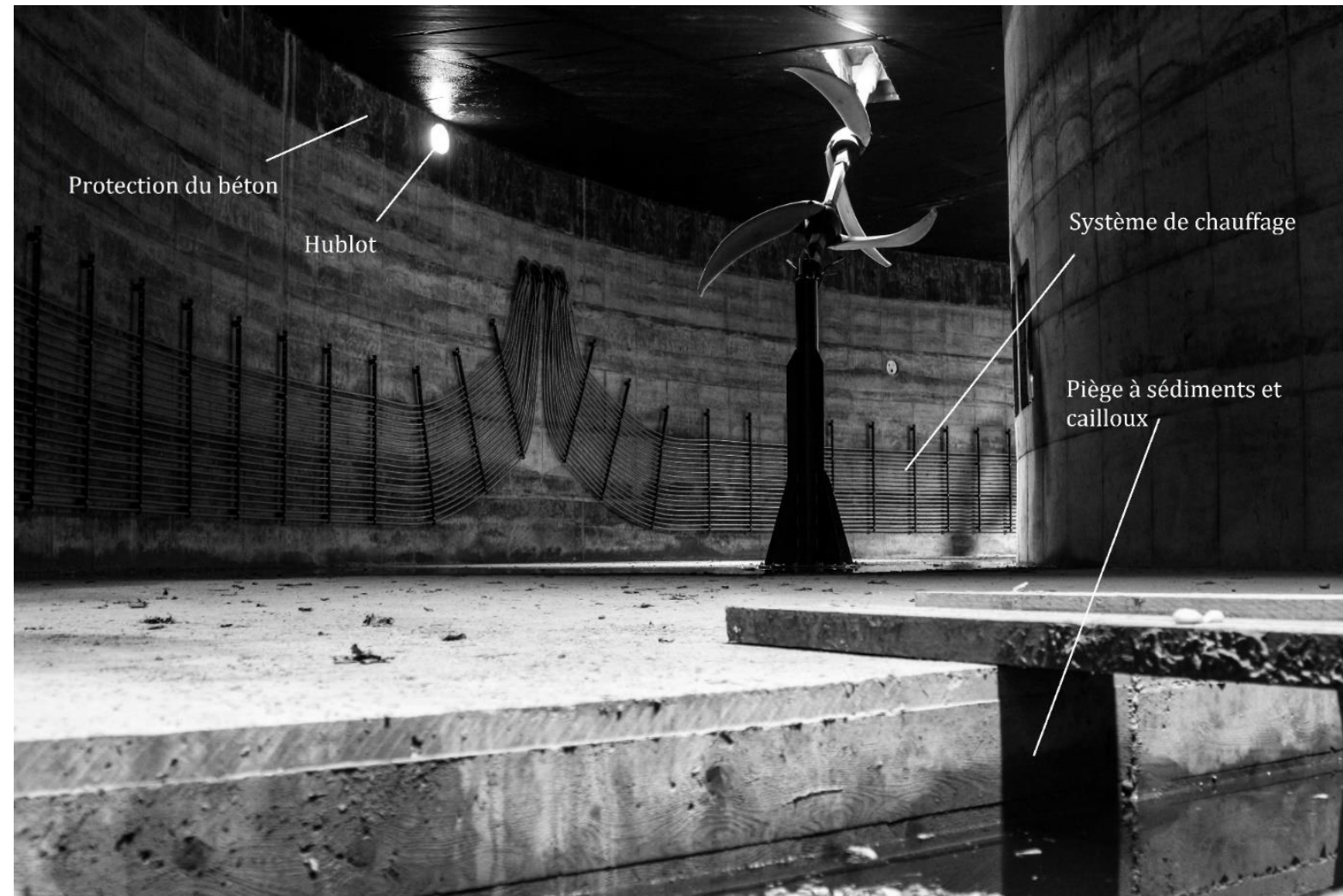


Left: Heat losses of PowerRing digester with concrete roof, right: Heat losses of digester with gas storage on top



Requirements for efficient operation of anaerobic digestion facilities

Simple service and maintenance




Requirements for efficient operation of anaerobic digestion facilities


High-performance numbers (AD plant availability) Technical Key parameters

- > 8.300 h total full load hours with 100 % performance
- > 84% of degradation
- > High-performance monitoring

Technological process optimisation – DEVELOPMENT OF AN EARLY-WARNING SYSTEM

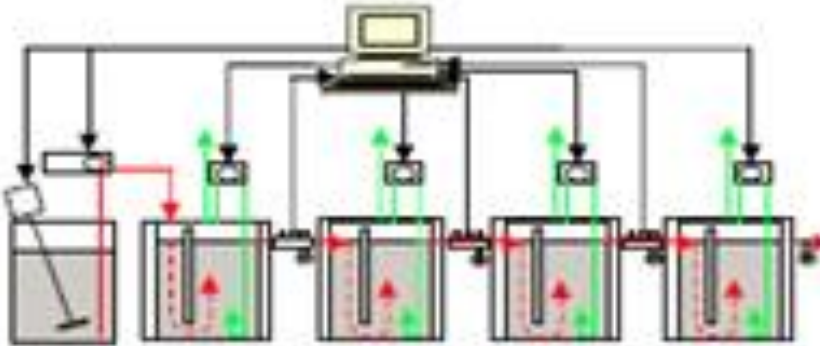



Universität für Bodenkultur Wien

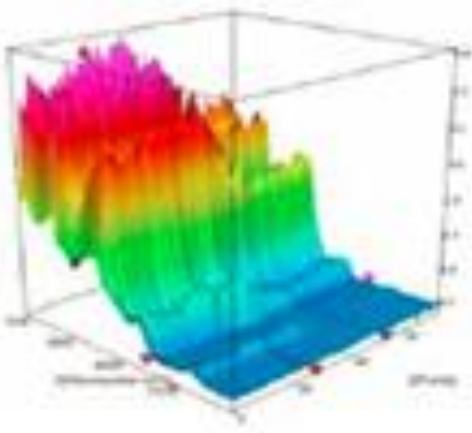


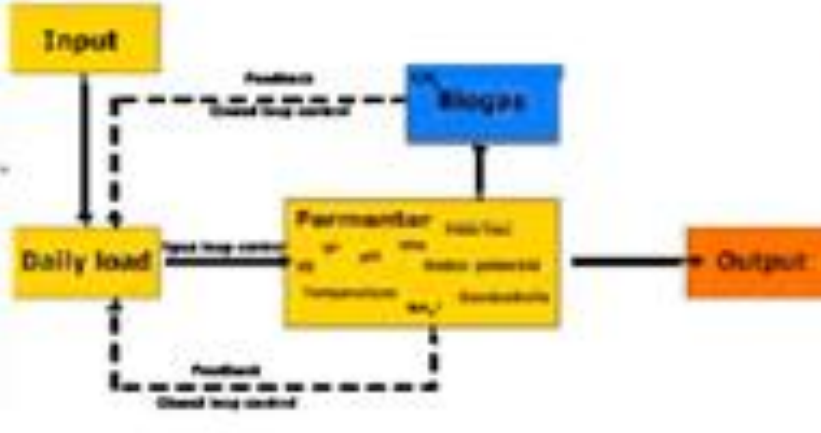
- Near infrared reflectance spectroscopy (NIRS)
- Real time monitoring through a mathematical model with the parameters:


- a) pH
- b) alkalinity
- c) VFAs
- d) VFA/TIC
- e) redox potential
- f) H⁺ in the biogas
- g) trends in biogas production












www.eu-agrobiogas.net



22



Georgi Kirov

Head of Sales & Market Development

georgi.kirov@biogest.at

+43 676 76 01 155



Katja Lyons

Technical and Sales Representative

katja.lyons@biogest-biogas.com

+61 431 722 876

+43 650 785 36 88