


BLAHOJ
BIO-ENERGI

Danish Biogas Co-digestion for Energy and Environment

What can Danish biogas technology do?

- Handle waste
- Reduce odour
- Increase nutrient accessibility
- Reduce nutrient leaching
- Provide CO₂- free energy
- Provide added revenue
 - Waste to energy
- Enrich the community
- Reduce GHG emissions

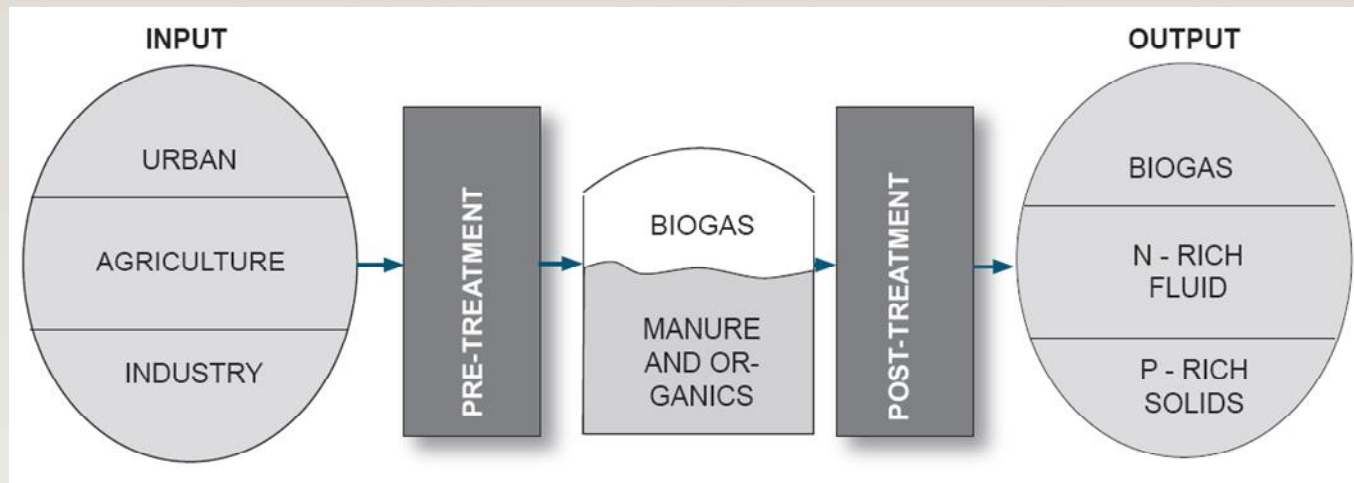


The technology: Anaerobic digestion

- Mesophilic or Thermophilic process
- Fully mixed digester
- Co-digestion concept
- Proven in Denmark
- We have made all the mistakes and learned



What is Biogas?



Biogas Plants in operation

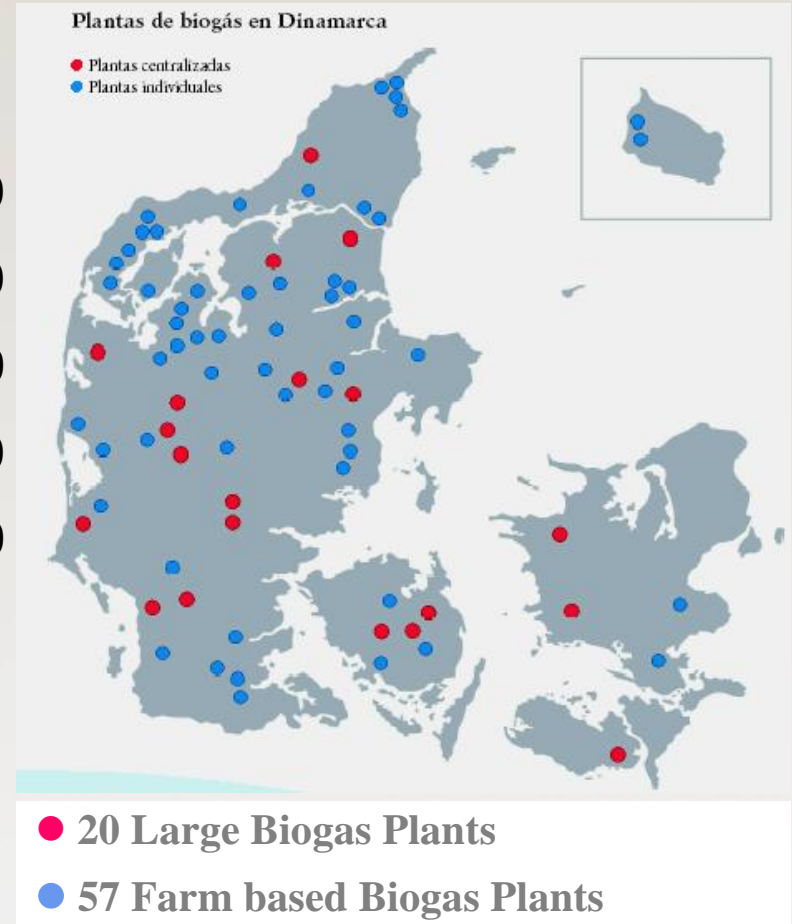
m³ biomass processed at:

Large plants 2004

- Animal manure 1.290.000
- Organic waste 275.000
- Total **1.565.000**

Farm Plants 300.000

Total annual **1.865.000**



Input material

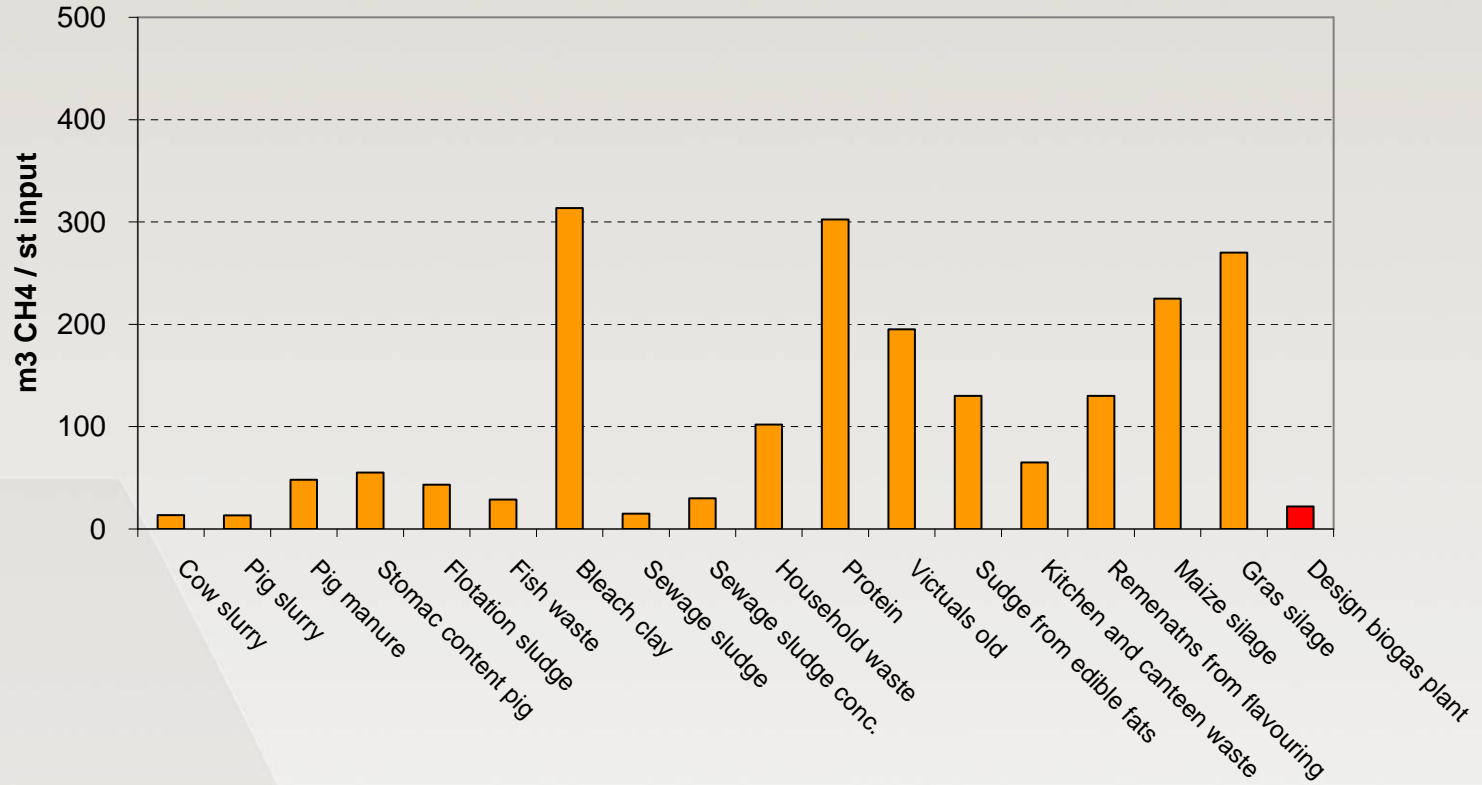
In principal all organic wastes that are

- Free of substances that inhibit the biogas process
- Suitable DM content
- Free of environmental toxic substances
- Sufficient biogas production

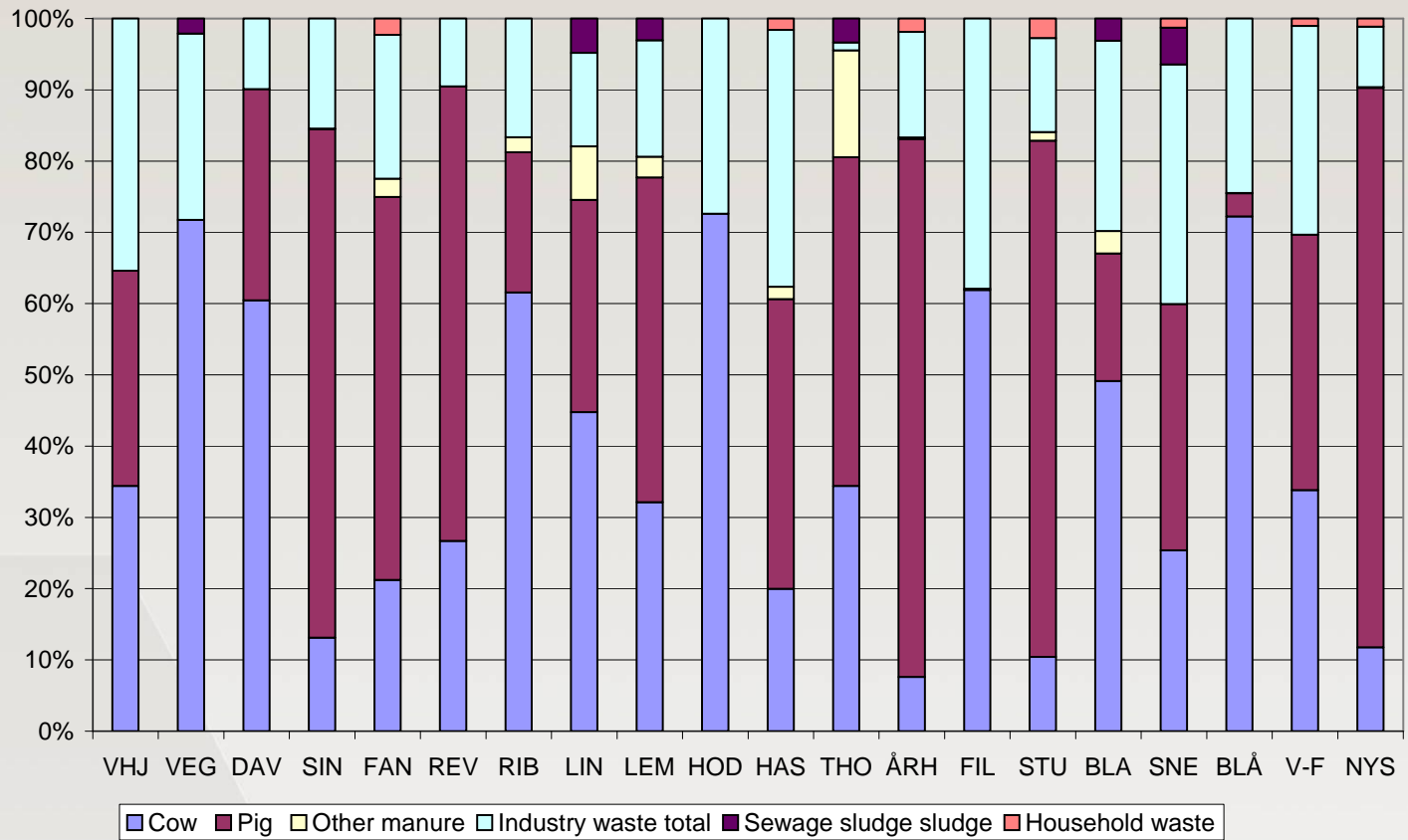


CH₄ production capacity

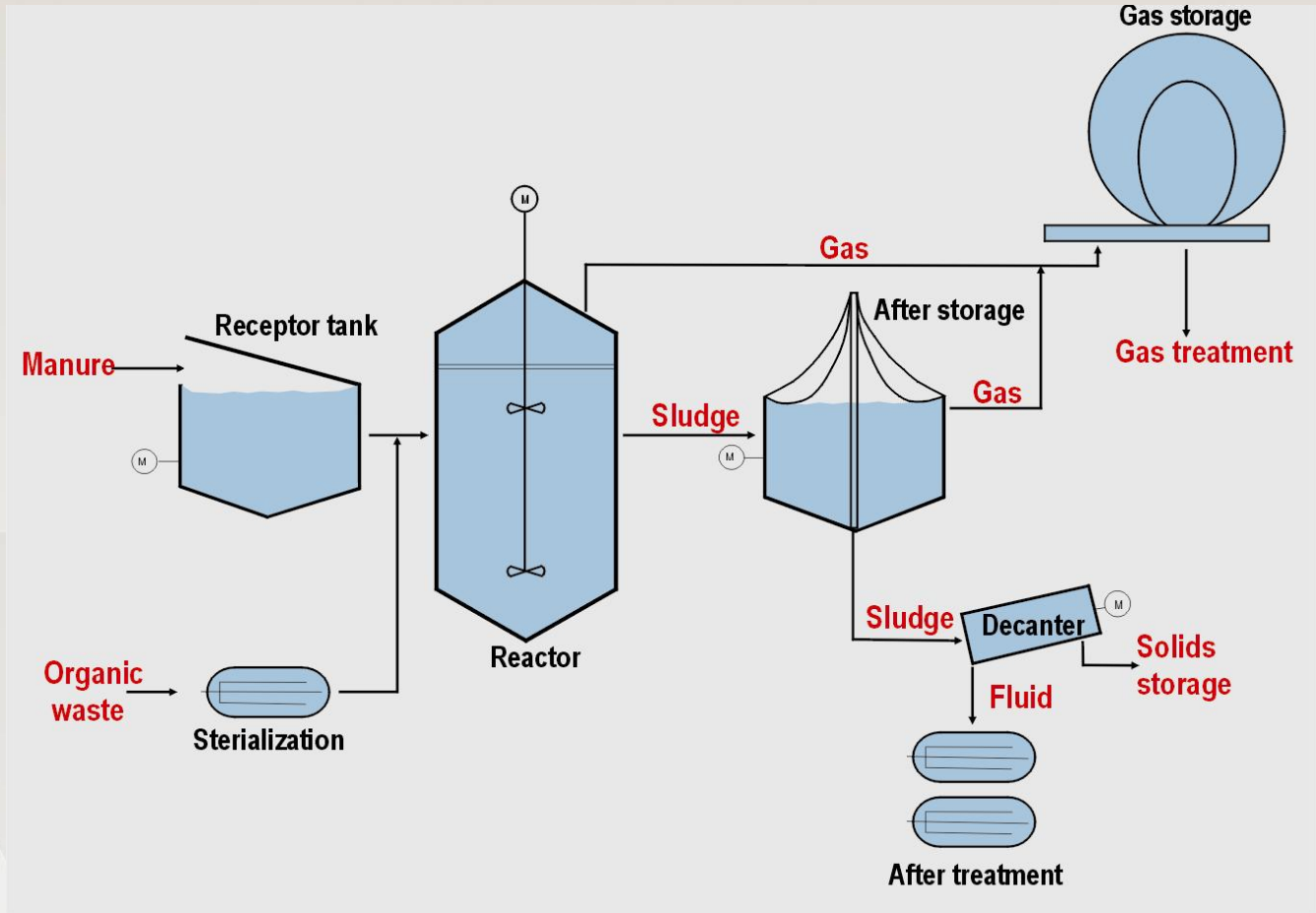
Methane production of selected substances



Input composition for the Danish Community Biogas Plants 2001



Biogas Plant design



Biogas technology

- Pre-treatment
 - Mixing
 - Macerating
 - Hygienisation/ sterilisation
 - +/- other pre-treatment: e.g. concentration
- Digestion
- After-treatment
 - Store
 - Separate
 - Upgrade
- End use
 - Land application
 - Move and apply
 - Transport market / or disposal



- Tankers
 - 20 m³
 - 30 m³
- Tippers
- Pipeline
- Average distance to plant
- Emptying cycle



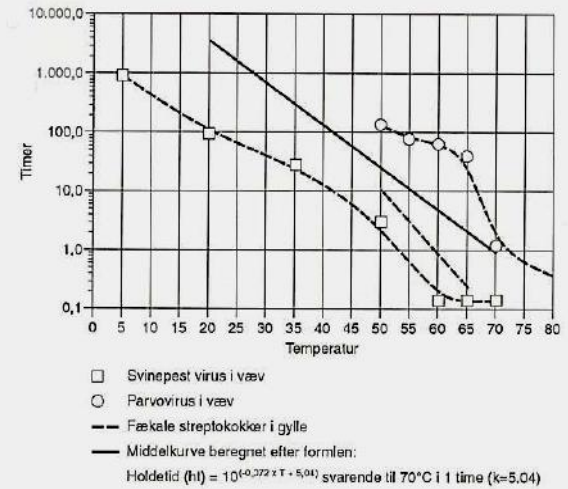
Pre-Treatment: Hygienisation / sterilization

- Hygienic step if recycling nutrients
- Separate unit to guarantee retention time
- Elimination of pathogens and weeds



Digesters

- Steel or concrete tanks
- Insulated
- Processes
 - mesophilic
 - thermophilic
- Pathogen reduction



Biological removal of H₂S

- Removal of H₂S by adding atmospheric air to biogas
- Bacteria that remove H₂S are present in manure
- In tank or on top of swing layer in e.g. after storage tank
- Separate tank



Biological air cleaning

- Removal of odours from exhaust air:
 - From the reception building
 - From the pre-storage tank
 - Buildings
- Location of the biogas plant important
- Regulations for nearest neighbors



After Storage

- Second digester
- Buffer for return of digestate or
- Buffer before after-treatment



Land application/ after-treatment

- Direct application to field
- After treatment - separation
- After treatment - upgrading



Fertiliser effect

- Nitrogen uptake increased from 40 to >70%
- Substitutes chemical fertiliser - adds organic matter to the soil
- Nutrients are recycled to land



Optional after treatment of digested material: e.g. separation

- Separation in solid and liquid fraction
- Different technologies
- Centrifuge
 - Solid fraction 12%
 - Liquid fraction 88%



Solids fraction

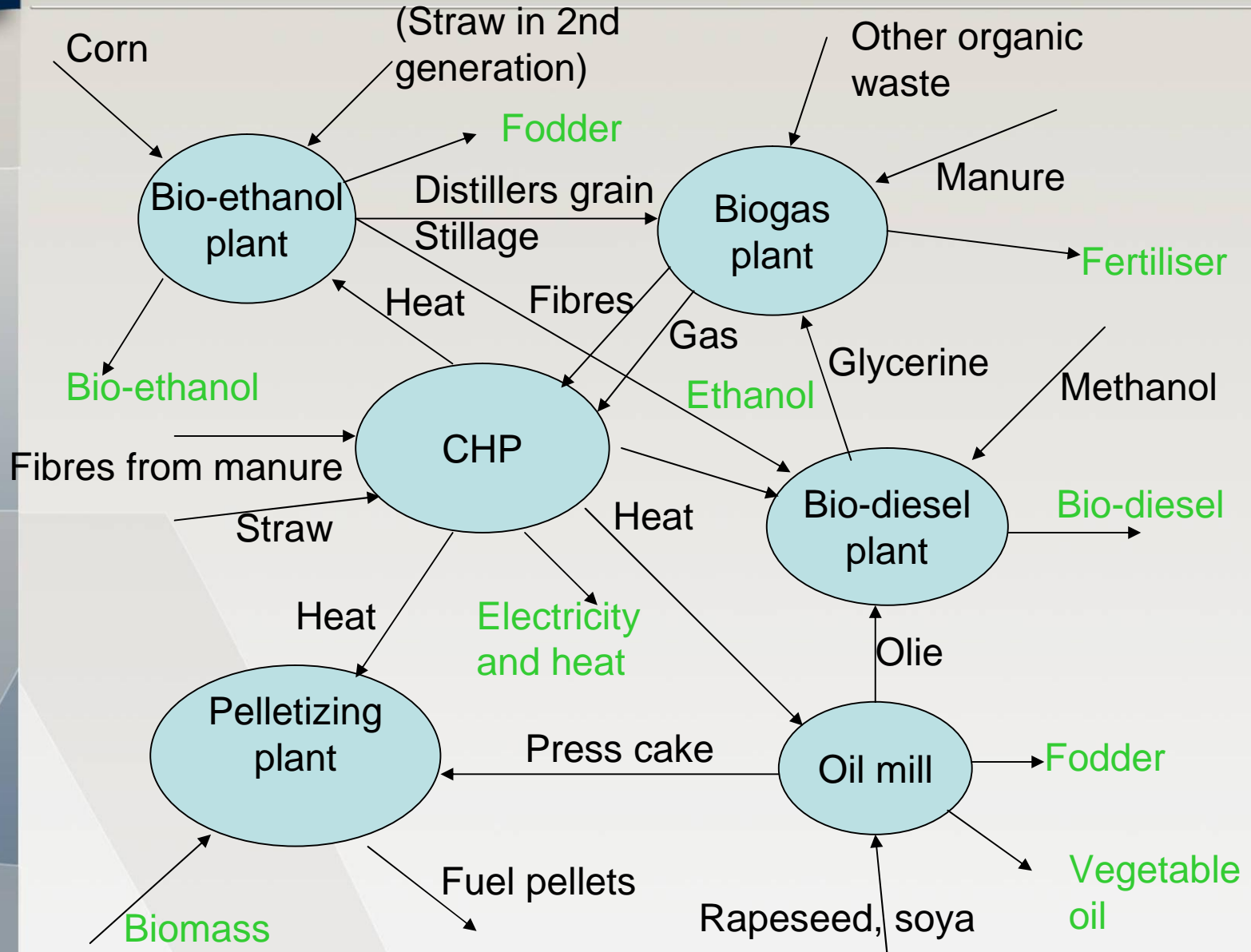
- Will contain most phosphorous
- Dry matter content up to 30%



- Various technologies can separate the liquid fraction in
 - Concentrated nutrients
 - Reject water



Biogas synergy with other RE





THANK YOU!

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