# How to assess potential for biogas production

## Understanding the scope, approaches, and uncertainties

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# About Me

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# Biogas potential studies: A review of their scope, approach, and relevance

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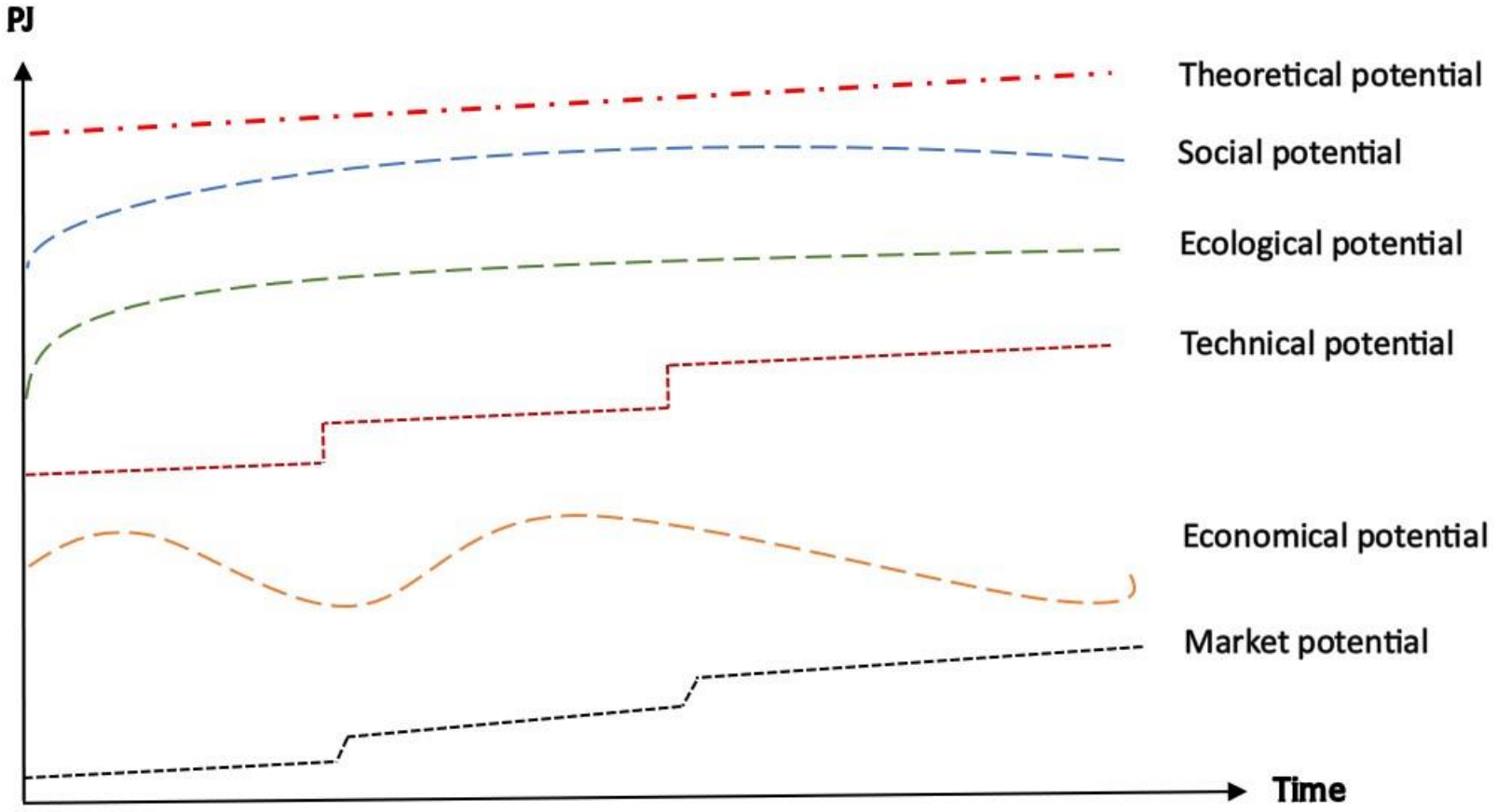
# TYPES OF BIOENERGY POTENTIAL




Source: Tjutju et al. (2024) , adapted from Egnell & Börjesson (2012)

- Theoretical potential: the maximum amount of biomass and bioenergy (and possibly other products) that can be produced with a certain geographical areas.
- Social (or institutional) potential: the potential which accounts the level of production that is socially acceptable and in line with policy and regulations.
- Environmental (or ecological) potential: the potential that is possible to achieve while taking environmental and ecological constraints into consideration (including both positive and negative environmental effects related to the bioenergy production system).
- Technical potential: the share that can be realised with available technology (may include considerations for future technical development).
- Economic potential: the fraction that is economically viable or considered most cost-efficient.
- Market/implementation/practical potential: the potential estimated to be realisable within the studied timeframe after considering all the other perspectives.

# HOW TO ASSESS BIOGAS POTENTIAL

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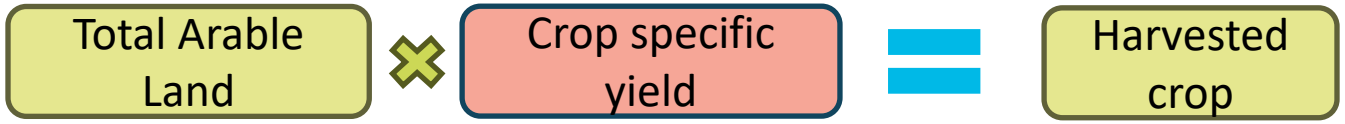
# COMMONLY USED APPROACH

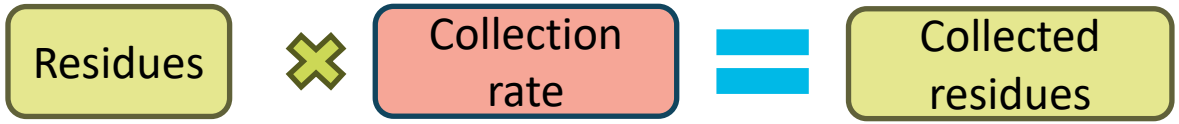
It is common to use a linear correlation between amount of biomass and the amount biogas.

Biomass × Conversion factors = Biogas

# ENERGY CROPS



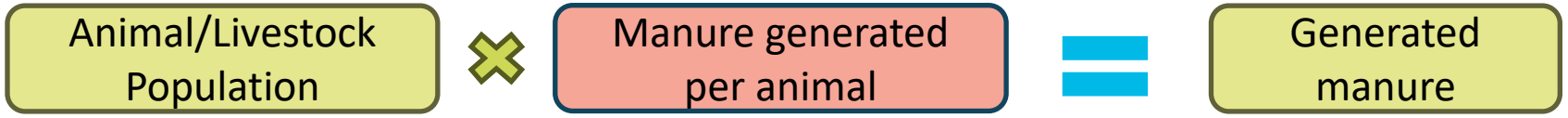

# CROP RESIDUES


PRR: product-to-residue ratio

Source: Tjutju et al. (2024)

# MANURE





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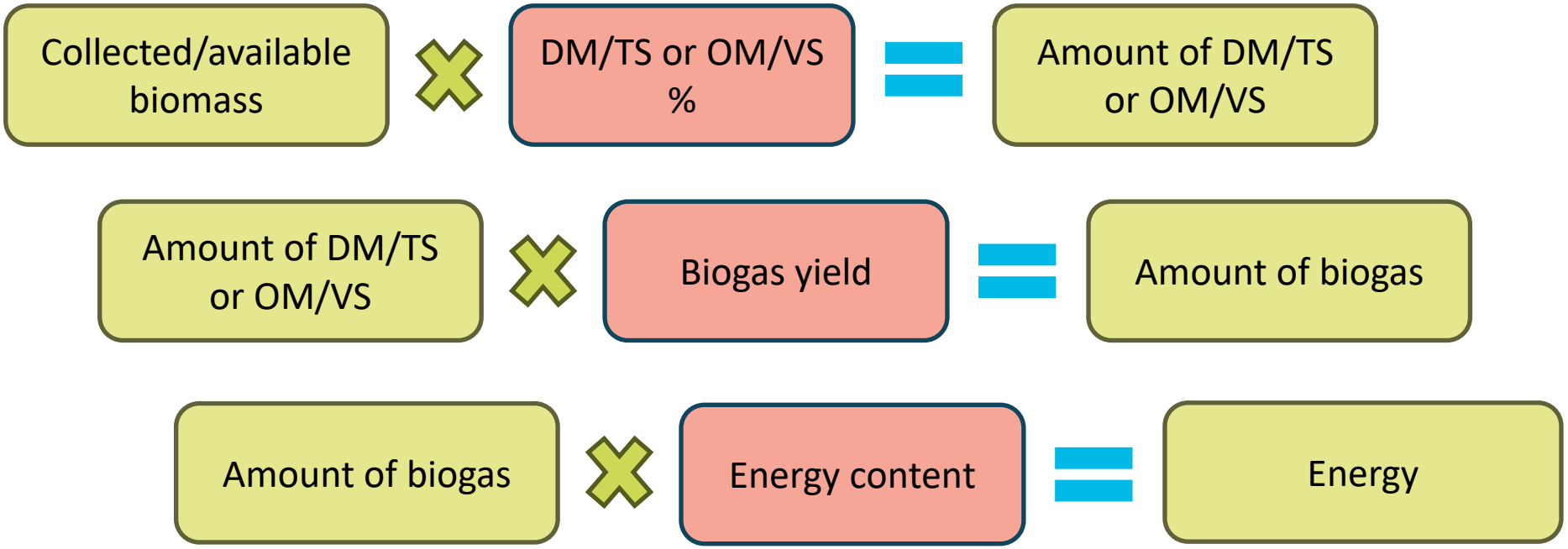
Source: Tjutju et al. (2024)




DM: dry matter, OM: organic matter
TS: total solids, VS: volatile solids

Source: Tjutju et al. (2024)

# TYPES OF DATA AND SOURCES

## Statistical report

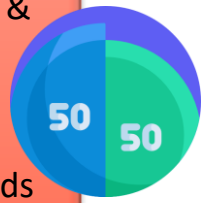
- Land area
- Crop yield
- Population
  - Livestock
  - Inhabitants
- Produced materials
- Generated waste

## Scientific literature

- Coefficients
  - Product-to-residue ratio
  - Dry matter & organic matter (%)
- Conversion factors
  - Volume of biogas per tonne feedstock
  - Energy content biogas per tonne feedstock

## Availability coefficient

- Crop residues tend to have other uses, e.g., fodder & soil conditioner
- Collection rate
  - Animal tend to have grazing & stable periods
  - Inhabitants in rural area might not be connected to the municipal services

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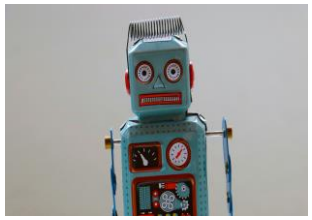
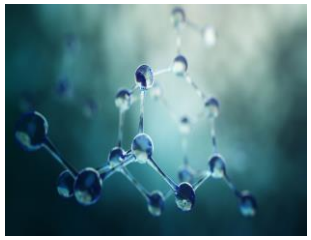
# CONSIDERATIONS FOR INTERPRETATIONS

- When possible, use conversion factors from production plant or pilot plant as they are closer to real conditions. Lab conditions might not represent the reality.
- Are you digesting a single substrate or multiple substrates at the same time? Conversion factors such as Biochemical Methane Potential (BMP) are normally for digestion of a single feedstock (mono-digestion). If digesting more than one substrate, this conversion factors may not be accurate.



The time perspective is important! It influences many aspects including the available feedstock's type and the biogas production technology development.

It is common to find agricultural waste (e.g., crop residues, manure), organic fraction of municipal solid waste (OFMSW), and organic industrial waste as feedstock for biogas production. Only few considered intermediate crops despite its large potential to improve agriculture practice and to produce biogas.



Are you assuming thermophilic or mesophilic conditions; wet or “dry” digestion? Do you include pre-treatment and/or post-treatment processes? Are you considering upgrading the biogas to biomethane?

Do you include potential for other co-products (e.g., digestate, carbon dioxide if biogas is upgraded into biomethane)? They can be important for the realization of biogas systems. The end use of these products may require further treatment!

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It is important to be transparent about the assumptions and methods! Your selection has a large impact on the uncertainties inherent in the result.

Some ways to “manage” the uncertainty:

- Showing the result in range rather than a single value
- Using scenarios to show what are the underlying assumptions
- Applying sensitivity analysis (on one important variable or more)

Inclusion of actors and stakeholders in the biogas potential assessments is highly encouraged.

Having a bottom-up approach can help to realise the potential.

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# Thank you

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