Potential in manure and agriculture – Nordic perspectives

CASE: Finland, Sweden & Denmark

Nordic Biogas Conference, Oslo, April 2019

Anna Virolainen-Hynnä,
Executive director,
Finnish Biogas Assocation

Suomen Biokaasuyhdistys
Finnish Biogas Association

Table of contents

Conditions & restrictions

Data & research reports used in the review

1. Danish Biogas Association.
2. Biogas i Danmark - status, barrierer og perspektiver Udarbejdet af Energistyrelsen februar 2014, ISBN: 978-87-93071-69-8. https://ens.dk/sites/ens.dk/files/Bioenergi/biogas_i_danmark_-_analyse_2014-final.pdf → **A report summarizes the work of the Danish biogas Taskforce set up by the Danish Energy Agency.**

1. Swedish Energy Agency (2018). Produktion och användning av biogas och rötrester år 2017.
2. Börjesson, P. (2016). Potential för ökad tillförsel och avsättning av inhemsk biomassa i en växande svensk bioekonomi. Lund: Lund University. Department of Technology and Society. Environmental and Energy Systems Studies https://portal.research.lu.se/ws/files/7279231/B_rjesson_P._2016._Rapport_nr_97_Milj_och_energisystem_Lunds_Universitet.pdf
3. Ahlgren, S., Björnsson, L., Prade, T., & Lantz, M. (2017). Biodrivmedel och markanvändning i Sverige. Lund, Swseden: Miljö- och energisystem, LTH, Lunds universitet. http://lup.lub.lu.se/search/ws/files/33712989/Ahlgren_mfl_Rapport_105_Milj_och_Energisystem_LTH.pdf → **Estimation on the potential of ILUC-free argi-biomasses available for biofuel production.**

1. Finnish Biogas Association.
2. Marttinen, S., Luostarinen, S., Winquist, E., Timonen, K. 2015. Rural biogas: feasibility and role in Finnish energy system. BEST suitable Bioenergy Solutions for Tomorrow. Research Report no 1.1.3–4.; http://bestfinalreport.fi/files/Rural%20biogas%20-%20feasibility%20and%20role%20in%20the%20Finnish%20energy%20system.pdf

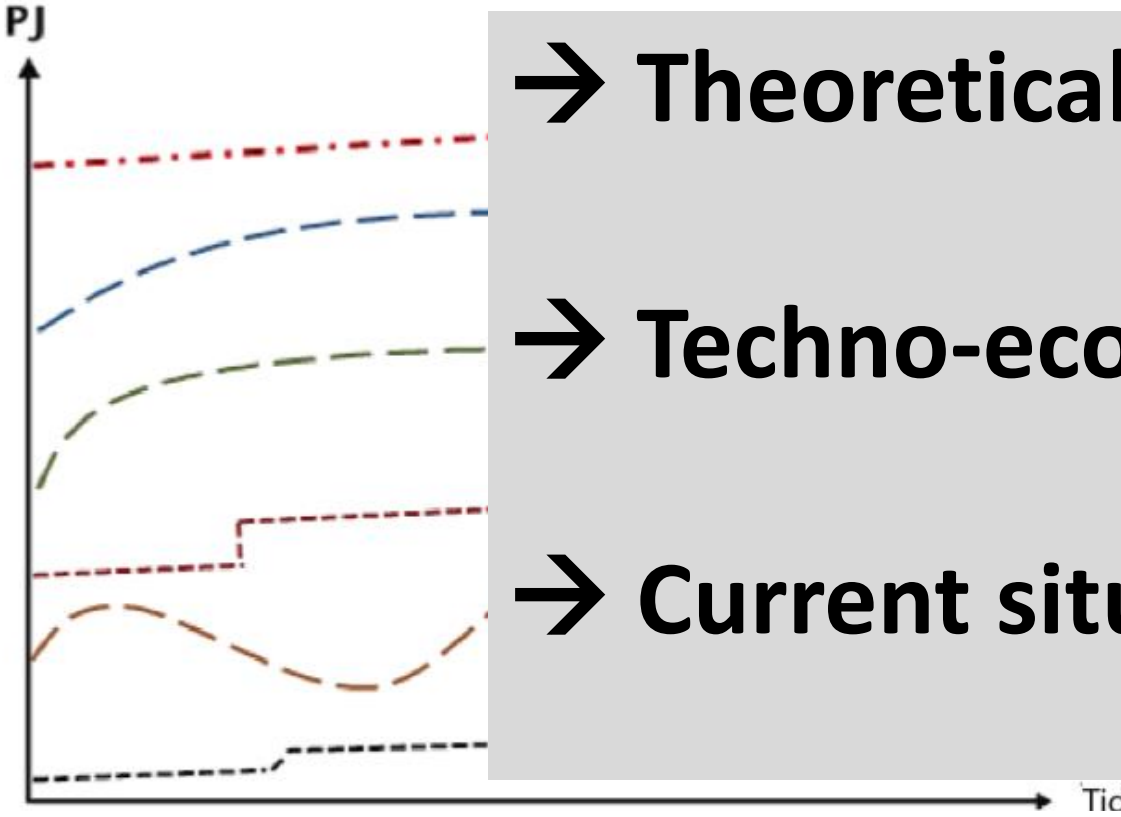
Feedstocks for biogas production

- Deep litter
- Solid litter
- Liquide manure/slurry
- Manure (cattle)
- Manure (pig)
- Manure (poultry)
- Manure (sheep and goat)
- Manure (horse and pony)
- Manure (fur animals)

- Fallow
- Protective zones
- Grass
- Straw
- 2nd crops
- Vegetable waste
- Natural habitats/uncultivated
- Buffer zones/”Fiels margins”
- Clover grass
- Roadside
- Sugar beet top

- Energy Maize
- Energy Beets
- Garden & park waste
- Biowaste
- Sewage sludge
- Food industries
- Pulp and paper industries
- Landfill
- Household waste
- Industrial residues
- Landfill

Facts about forecasting & estimating production potential



→ Theoretical potential

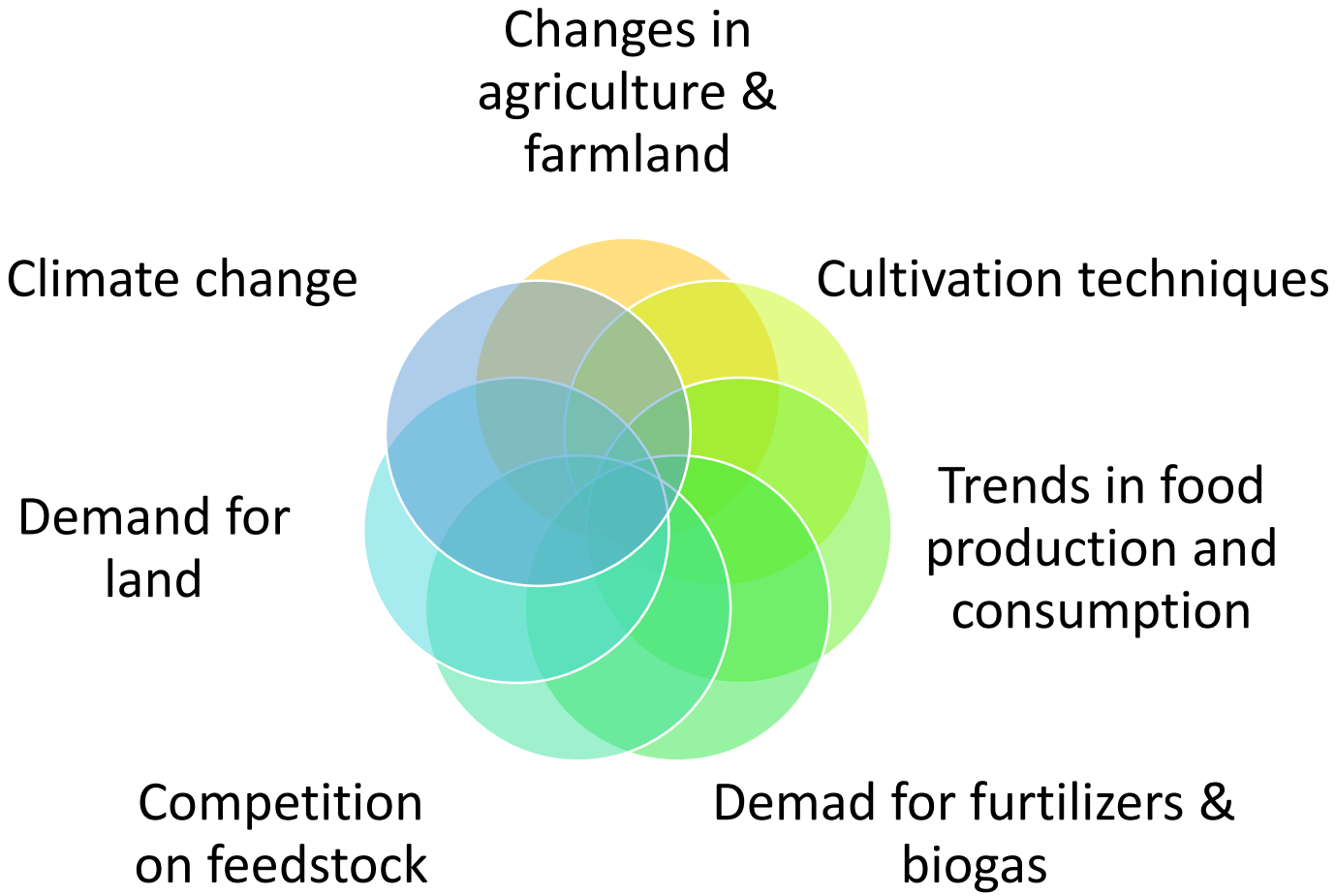
→ Techno-economical potential

→ Current situation (2017)

Figur 1. *Schematisk figur som generellt illustrerar olika potentialbegrepp, där den potentiella marknadspotentialen, på grund av sociala, ekologiska, tekniska och ekonomiska begränsningar, är långt under den teoretiska potentialen (se text för utförlig beskrivning) (Egnell & Börjesson, 2012).*

Source: Börjesson, P. (2016). Potential för ökad tillförsel och avsättning av inhemsk biomassa i en växande svensk bioekonomi. Lund: Lund University. Department of Technology and Society. Environmental and Energy Systems Studies. Link.

What factors affect the biogas potential from argi-biomasses?



Starting point – general picture about biogas production (TWh)

SWEDEN

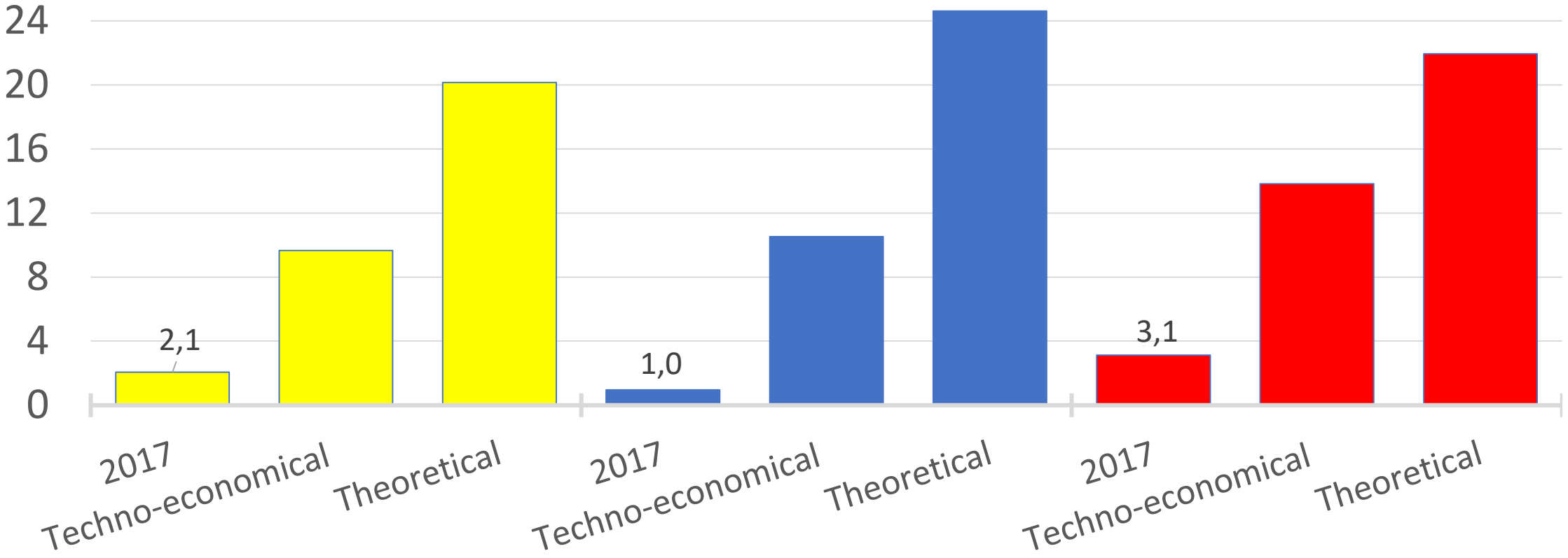
2016: 279 (farms 41 ~ 16%)

FINLAND

2017: 105 (farms 20 ~ 19%)

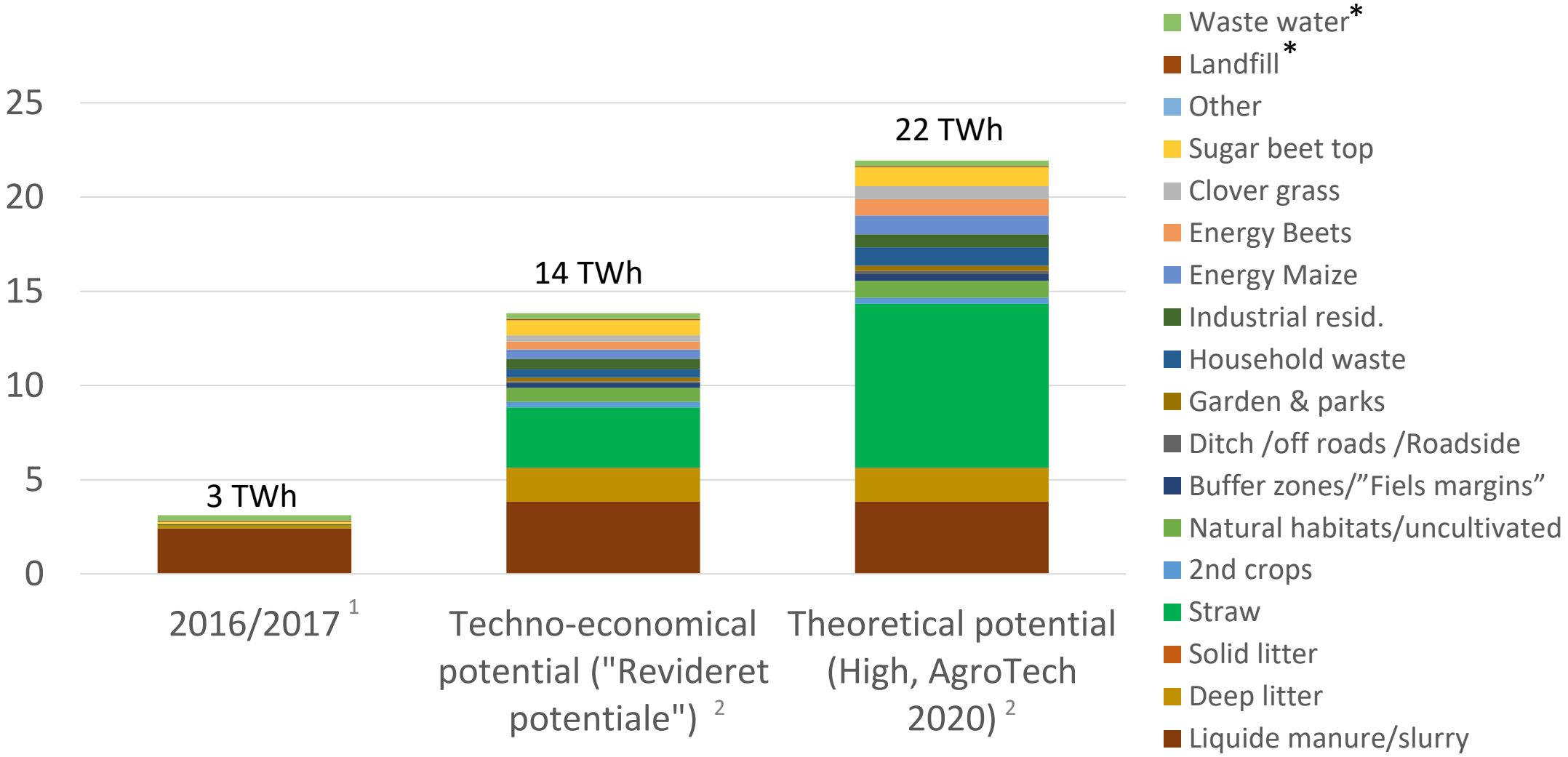
DENMARK

2015: 153 (farms 68 ~ 44%)



Denmark

Denmark: biogas production in 2017 and potentials (TWh)

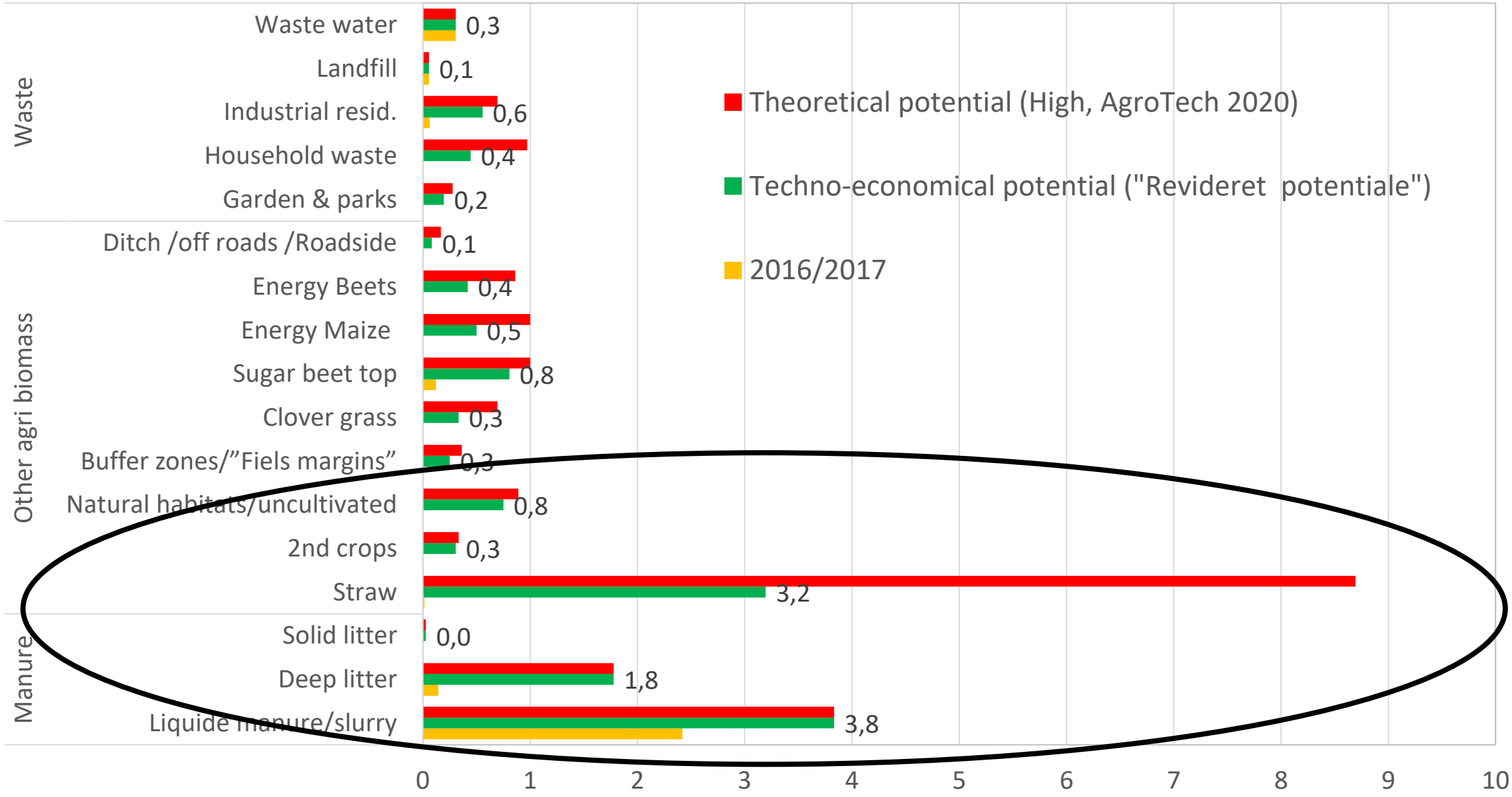


[1] Danish Biogas Association

[2] Biogas i Danmark - status, barrierer og perspektiver Udarbejdet af Energistyrelsen februar 2014, ISBN: 978-87-93071-69-8. https://ens.dk/sites/ens.dk/files/Bioenergi/biogas_i_danmark_-_analyse_2014-final.pdf.

* The production figures for waste water and landfill are the same as in 2016/2017, they are not given in the Biogas i Denmark –report.

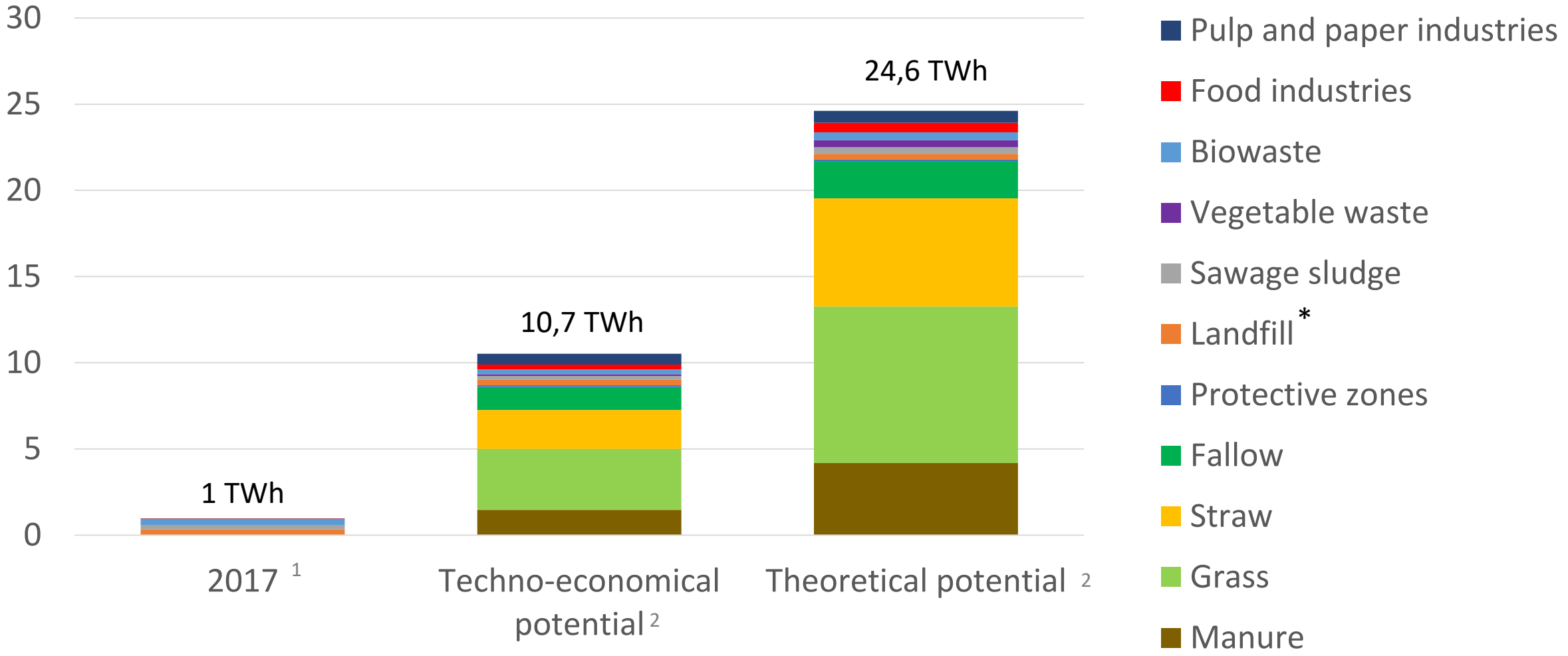
Denmark: biogas production by substrate (TWh)



Finland

Finland: biogas production in 2017 and potentials

(TWh)

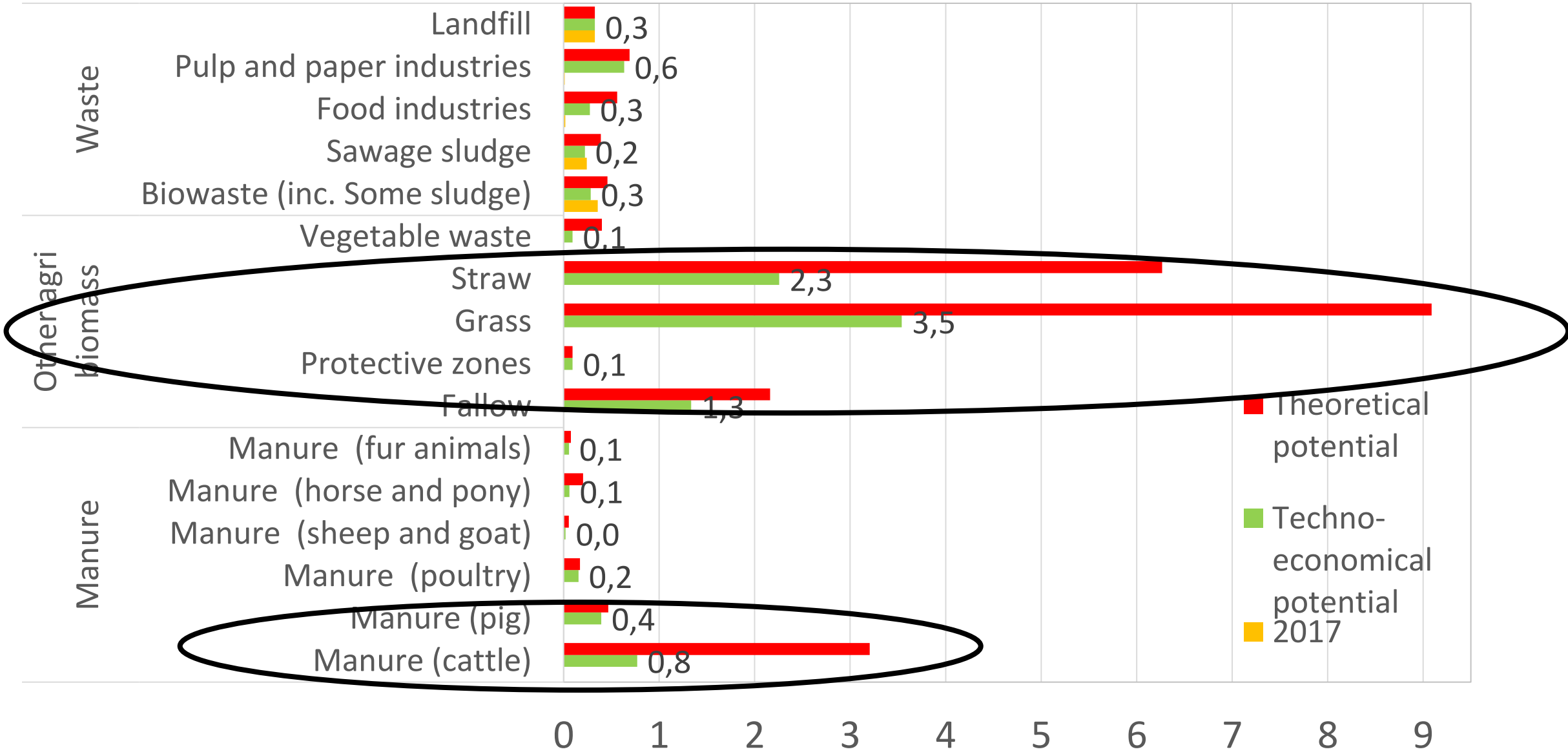


[1] Finnish Biogas Association;

[2] Marttinen, S., Luostarinen, S., Winquist, E., Timonen, K. 2015. Rural biogas: feasibility and role in Finnish energy system. BEST suitable Bioenergy Solutions for Tomorrow. Research Report no 1.1.3–4.; http://bestfinalreport.fi/files/Rural%20biogas%20-%20feasibility%20and%20role%20in%20the%20Finnish%20energy%20system.pdf

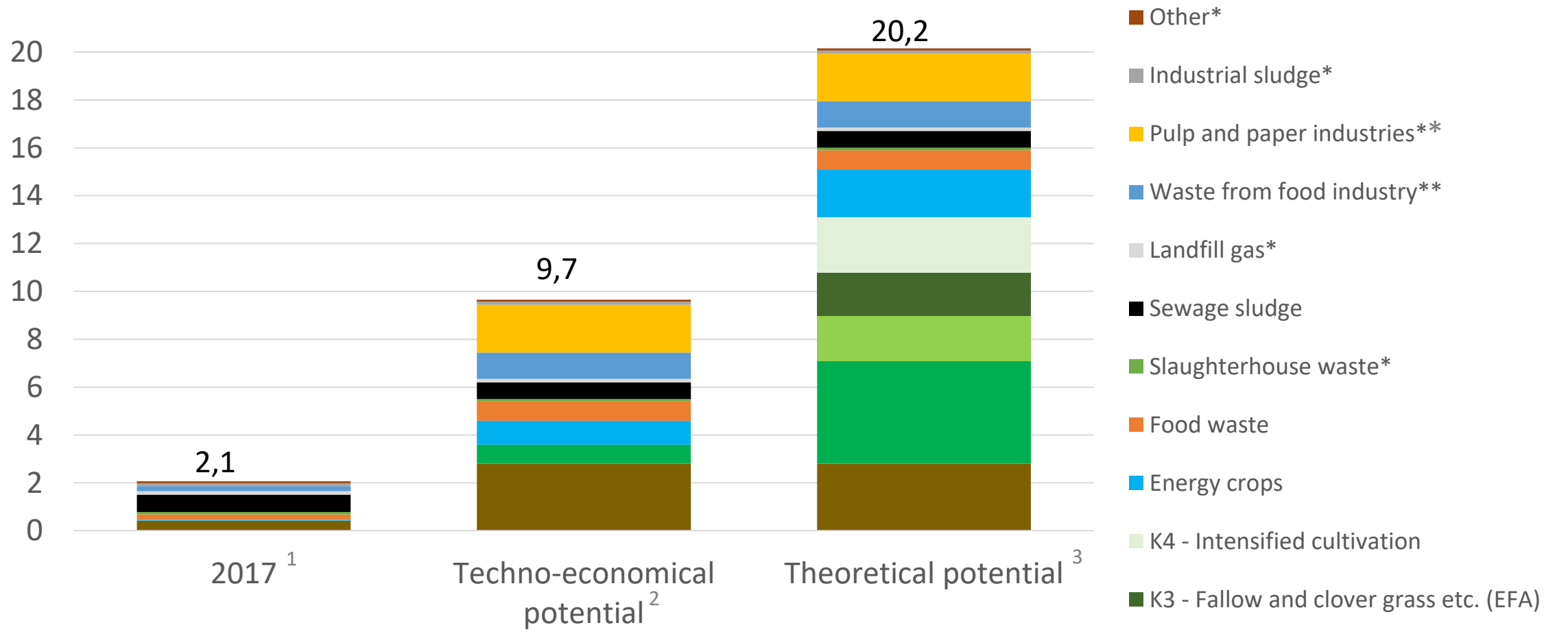
* Landfill production figures are from 2017.

Finland: biogas production by substrate (TWh)



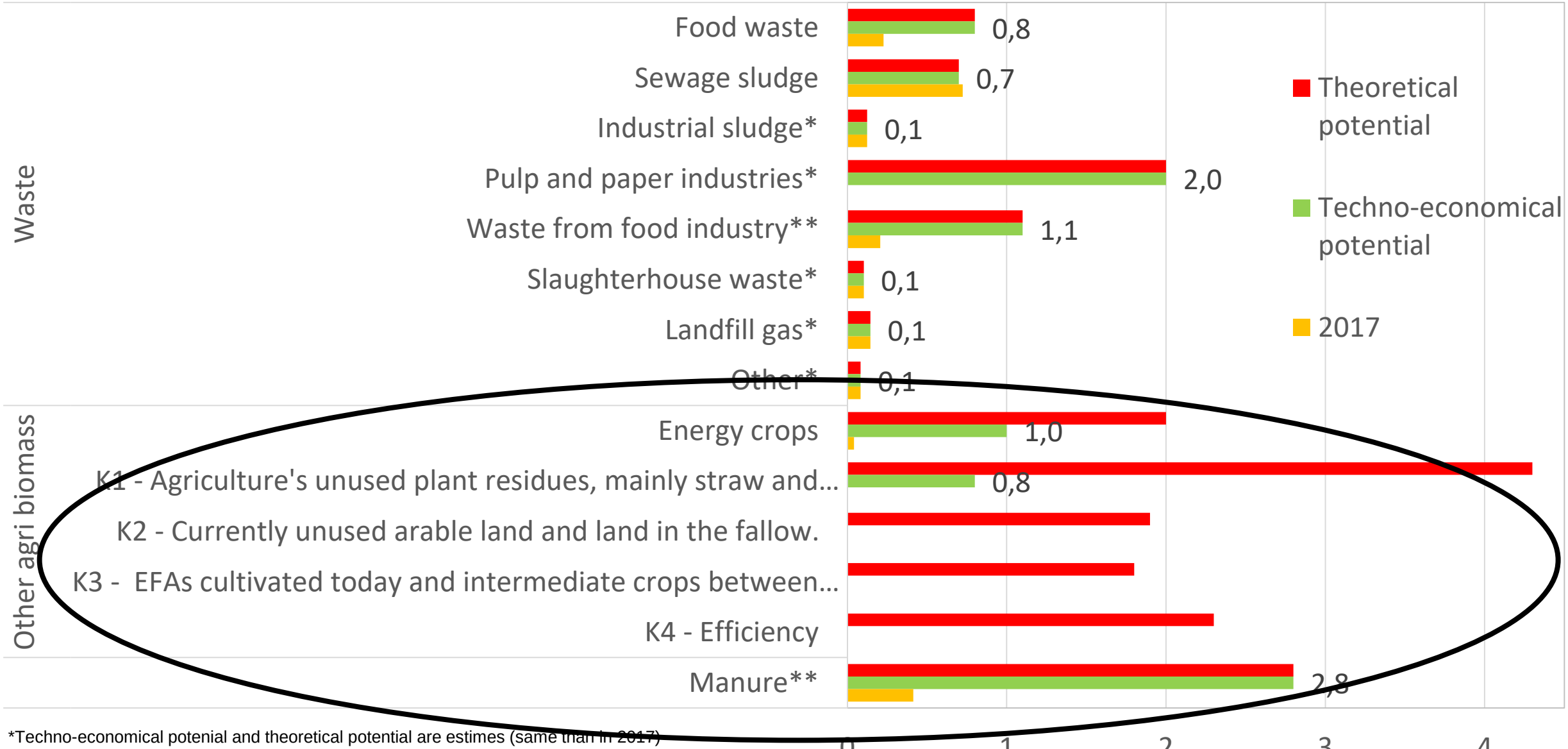
Sweden

Sweden: 2017 and Potentials



[1] Swedish Energy Agency (2018). Produktion och användning av biogas och rötrester år 2017.
[2] Börjesson, P. (2016). Potential för ökad tillförsel och avsättning av inhemsk biomassa i en växande svensk bioekonomi. Lund: Lund University. Department of Technology and Society. Environmental and Energy Systems Studies. Link.
[3] Ahlgren, S., Björnsson, L., Prade, T., & Lantz, M. (2017). Biodrivmedel och markanvändning i Sverige. Lund, Swseden: Miljö- och energisystem, LTH, Lunds universitet. Link.
*Techno-economical potential and theoretical potential are estimates (same than in 2017)
** Theoretical potential is an estimate (same at the techno-economical potential)

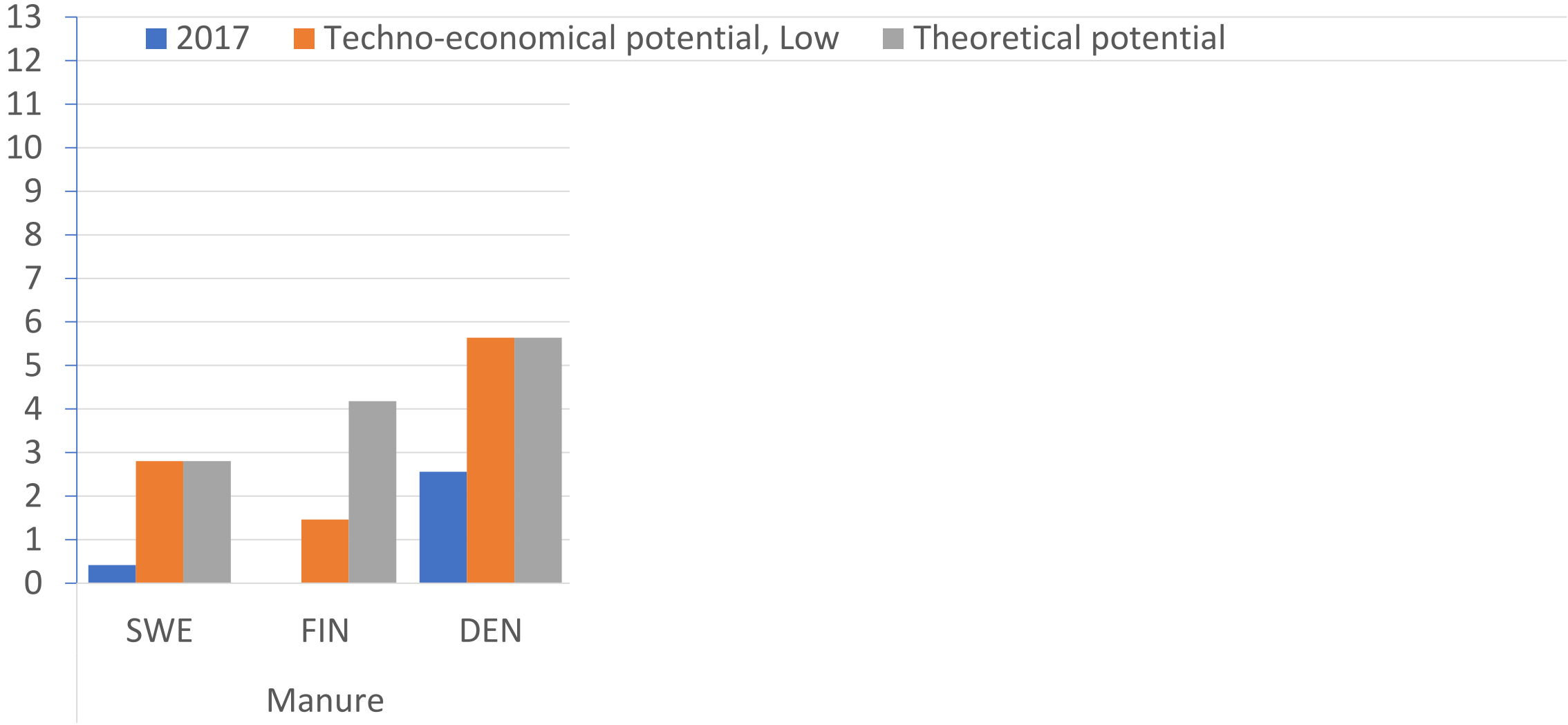
Sweden: biogas production by substrate (TWh)



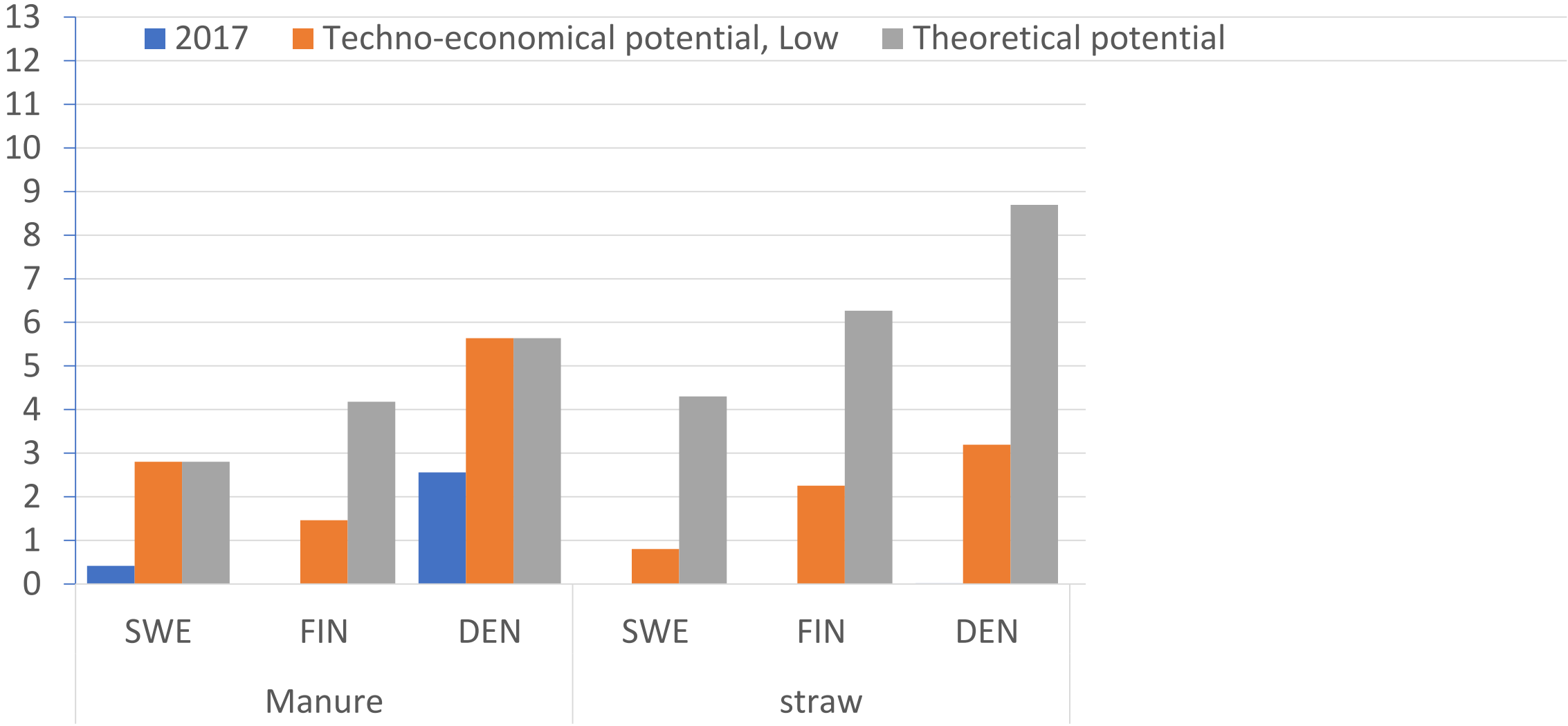
*Techno-economical potenial and theoretical potential are estimes (same than in 2017)
** Theoretical potential is an estimate (same is the techno-economical)

Summary & conclusions

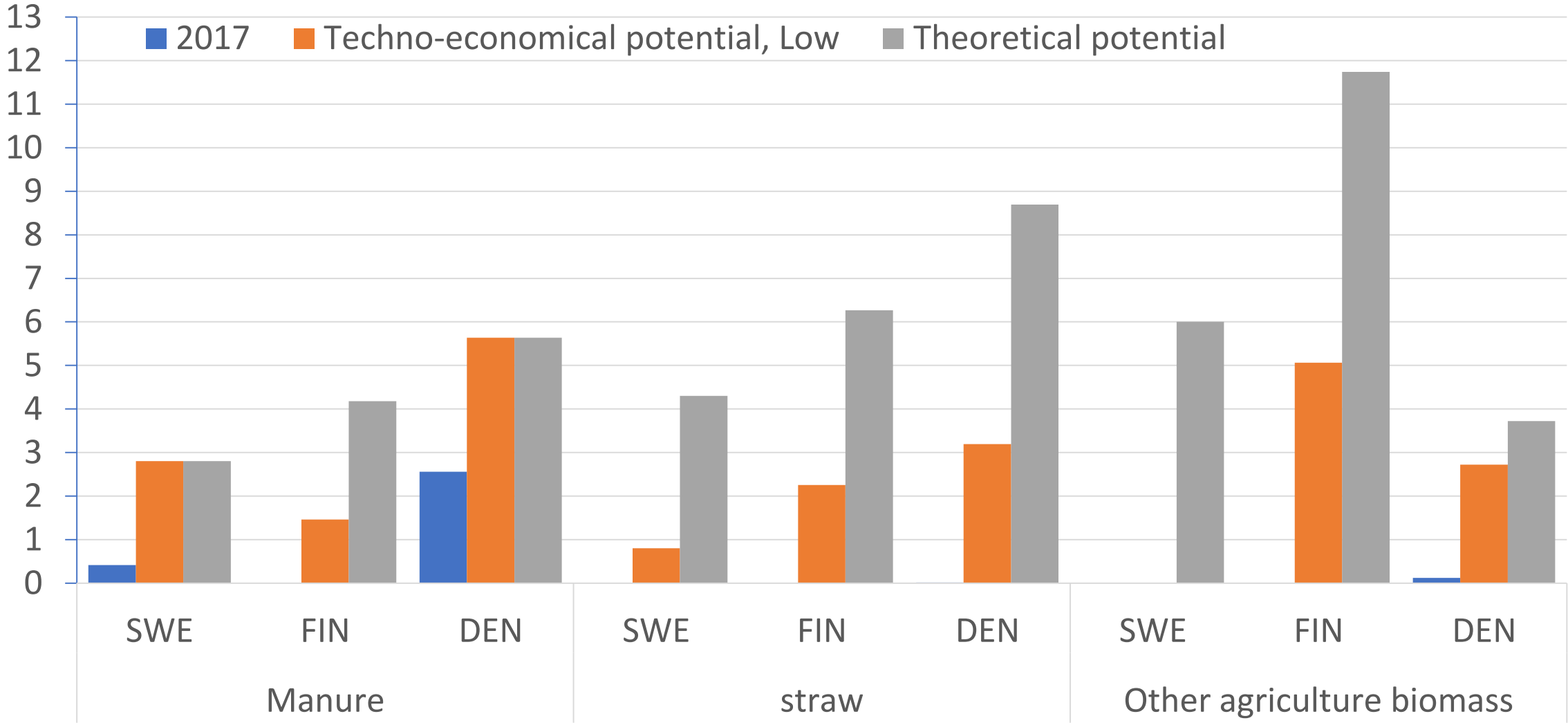
Agri-biomass potential in Sweden, Finland and Denmark (TWh)



Agri-biomass potential in Sweden, Finland and Denmark (TWh)



Agri-biomass potential in Sweden, Finland and Denmark (TWh)



Summary

- Estimations on the future potential are important – the biogas sector needs to show, we can be part of the solution e.g. GHG-emission, sustainability requirements
- There is plenty of potential agri-biomasses for biogas production
- Possibilities for new business solutions – scalability?
- Difference in data, difficult to compare

Thank you!