



1. Is there a need for biogas software? How can we address the need?

Why? We need biogas software for:

1. Accurate and standardized results
2. Quick data processing
3. Easy, reliable predictions

What? We've developed two **free** solutions

1. **OBA**: the Online Biogas App
2. The **biogas package** for R

How? With R and Shiny

1. Open-source: verifiable
2. Available to all, for free
3. No programming skills needed (OBA)



2. What can you do with OBA and the biogas package?

Use for data processing, theoretical calculations, and simple conversions

Data processing: BMP example

OBA

Raw data

Setup or grouping

Flexible input options
Excel or text (e.g., CSV) files;
three different data structures (including AMPTS II); volume, pressure, or mass data; separate or combined files

Or with the biogas package

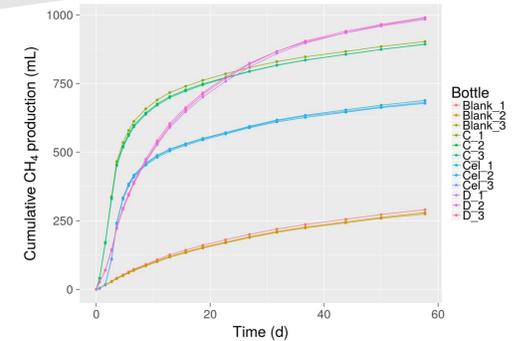
```
cum.prod <- cumBg(bgdatt, temp = "temp", dat.name = "pres.int",
pres.resid = "pres.final", headspace = setup,
vol.hs.name = "vol.hs", absolute = FALSE,
pres.init = 0, pres.amb = 1013,
temp.init = 20, time.name = "time.d",
unit.pres = "mbar")

summBg(cum.prod, setup = setup, time.name = "days",
noc.name = "BK", inoc.name = "m.inoc",
norm.name = "m.sub.vs", when = "1p3d")
```

Multiple options for display of results

Cumulative production (shown) and rates by bottle or reactor

Results



Flexible summary: any or all times, or 1% criterion

| Substrate | Time (d) | BMP (mL g ⁻¹) | |
|--------------|----------|---------------------------|-----------|
| | | Mean | Std. dev. |
| Cellulose | 19 | 319 | 3.1 |
| Feed ingred. | 16 | 454 | 6.9 |
| Grass | 37 | 257 | 2.1 |

Notes: BMP = Biochemical methane potential, CH₄ volume (dry, 101.325 kPa, 0°C) per g substrate VS.

Download complete output data, summary, or plots

Theoretical BMP or biogas production predictions

OBA example: theoretical BMP of food waste

Flexible description of substrate: 3 options

CH₄ for 1 g VS.

Include optional details to predict biogas production

Temp. and pH used for CO₂ partitioning

Overall reaction:



Biogas and CH₄ per kg substrate (wet mass)

For even more flexibility, use the biogas package

biogas package example: effect of pH on composition of biogas from sludge

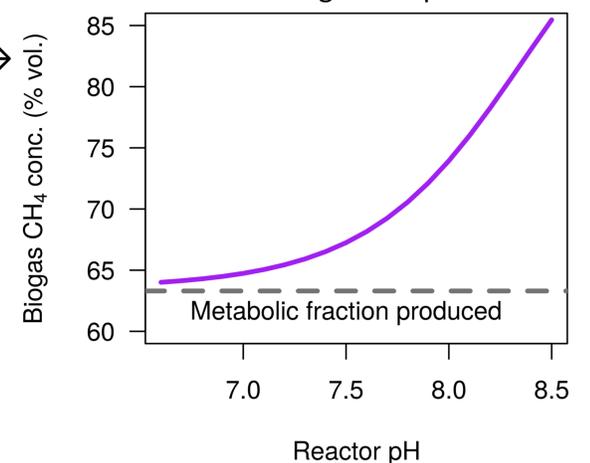
```
> predBg("C10H19O3N", mass = 1, fs = 0.05, fd = 0.5, conc.sub = 80, pH = 6.5 + 1:20/10,
temp = 55, value = "all")
```

Theoretical BMP using the biogas package

```
> calcCOD(c("CHOOH", "CH3COOH", "CH3CH2COOH", "CH3(CH2)2COOH", "CH3(CH2)3COOH"))
[1] 0.3476296 1.0657430 1.5119199 1.8160356 2.0366200
COD in g O per g VS →
> predBg(c("CHOOH", "CH3COOH", "CH3CH2COOH", "CH3(CH2)2COOH", "CH3(CH2)3COOH"))
[1] 121.4563 372.3538 528.2409 634.4941 711.5628 ←
Max possible CH4 yield in mL per g VS
```

```
> predBg(mcomp = c(C10H19O3N = 80, carbohydrate = 15, C3H8O3 = 5), mass = 1)
[1] 640.498 ←
Max. possible CH4 640 mL/g
```

Predicted biogas composition



3. Want to learn more?

Learn more, try out the software, join the mailing list, help improve it

1. Sign up for mailing list: email sasha.hafner@eng.au.dk
2. Check out our open access paper in SoftwareX: <https://doi.org/10.1016/j.softx.2018.06.005>
3. The biogas package is available on CRAN: Google **biogas package**
4. For OBA see <https://biotransformers.shinyapps.io/oba1/>