

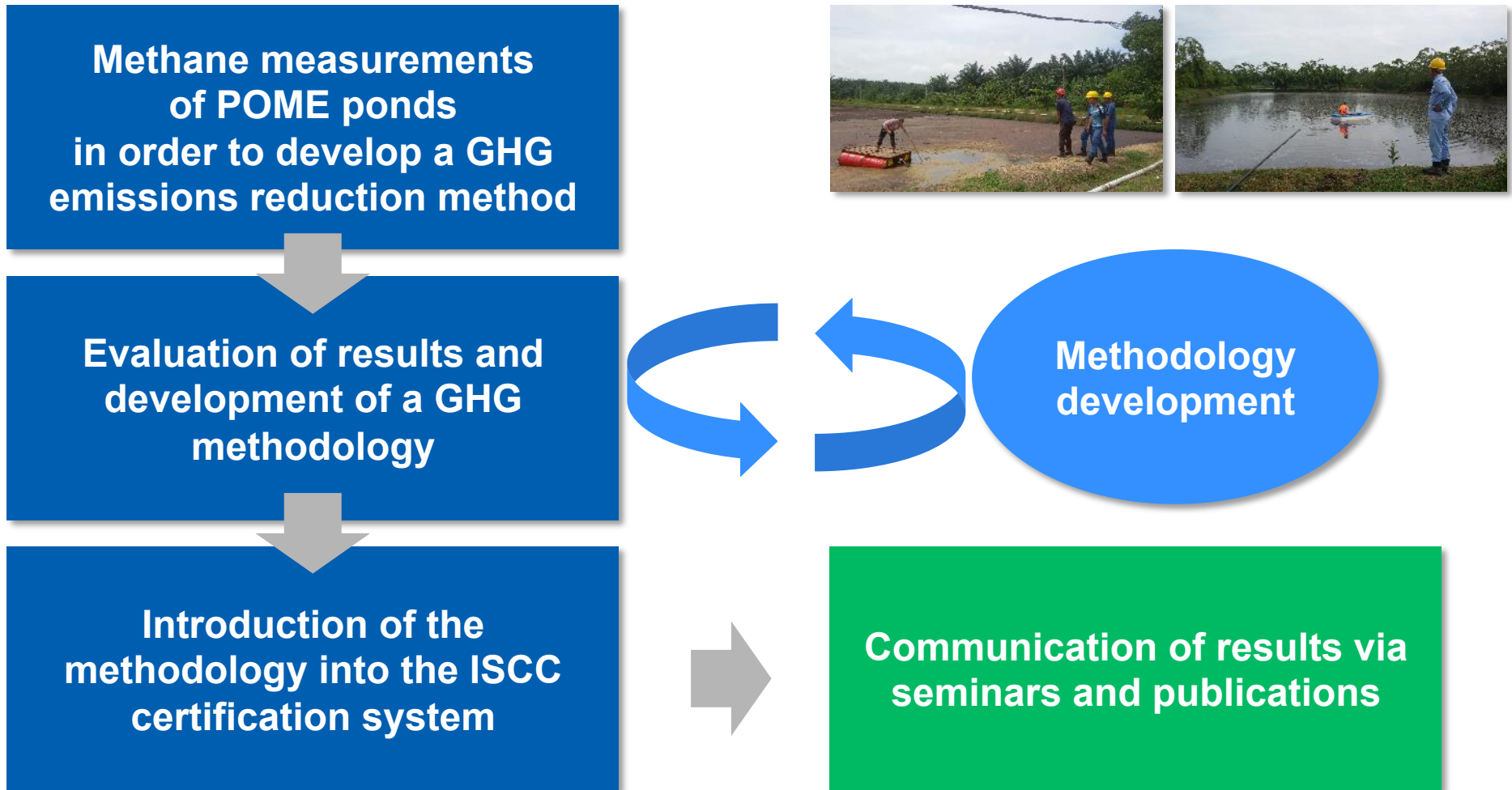


ISCC Stakeholder Meeting Southeast Asia, Penang, December 6, 2016

Methane Measurements on POME ponds – what are they good for?

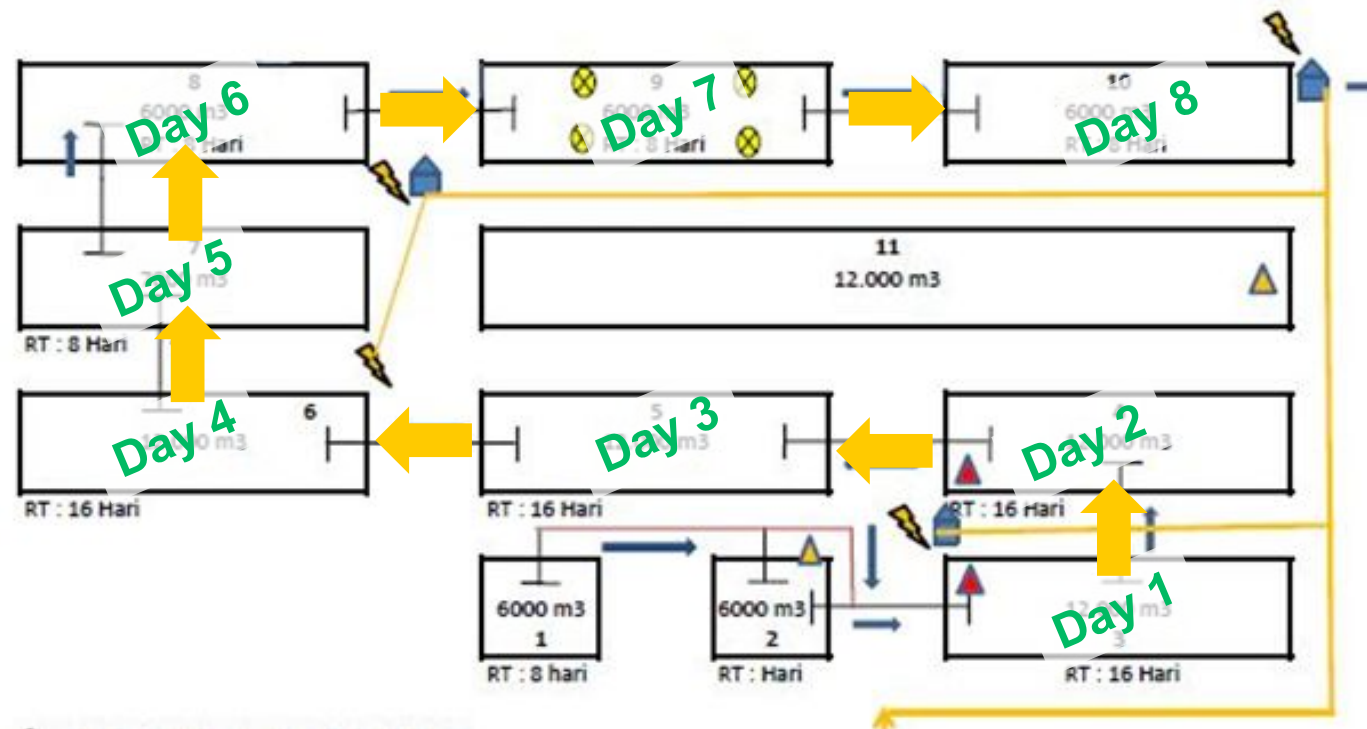
Andreas Feige, Managing Director, ISCC System GmbH

Methane measurements – idh funded project with KLK, Neste and ISCC partnering



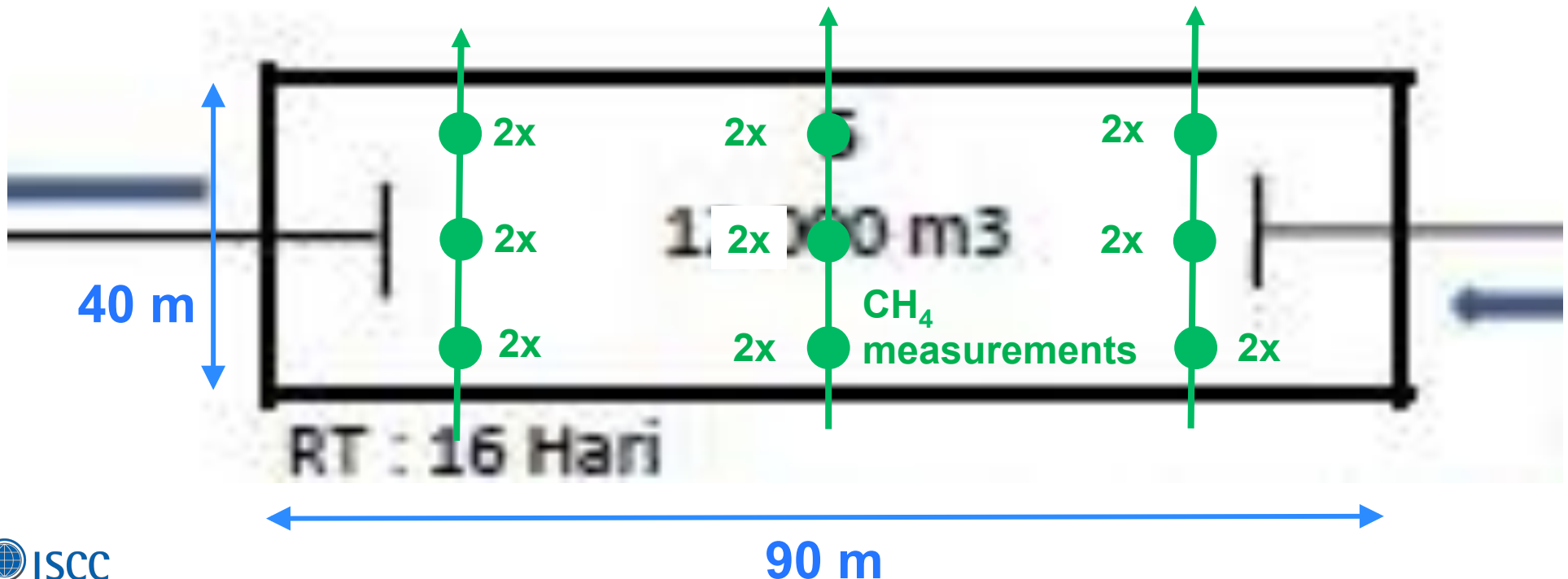
Design of measurement setup (I)

- Ponds are measured in transects on a daily rotational mode for CH₄
 - I.e. one CH₄-measurement rotation for all (three aerobic and five anaerobic) ponds will take 8 days
- After 8 days measurements are repeated twice (three rotation mode)



Design of measurement setup (II)

- Ponds are measured in three transects on a daily rotational mode for CH₄
 - I.e. one CH₄-measurement rotation for all (aerobic and anaerobic) ponds will take 8 days
- Every transect has three measuring points repeated twice
- Chamber closure time is five minutes

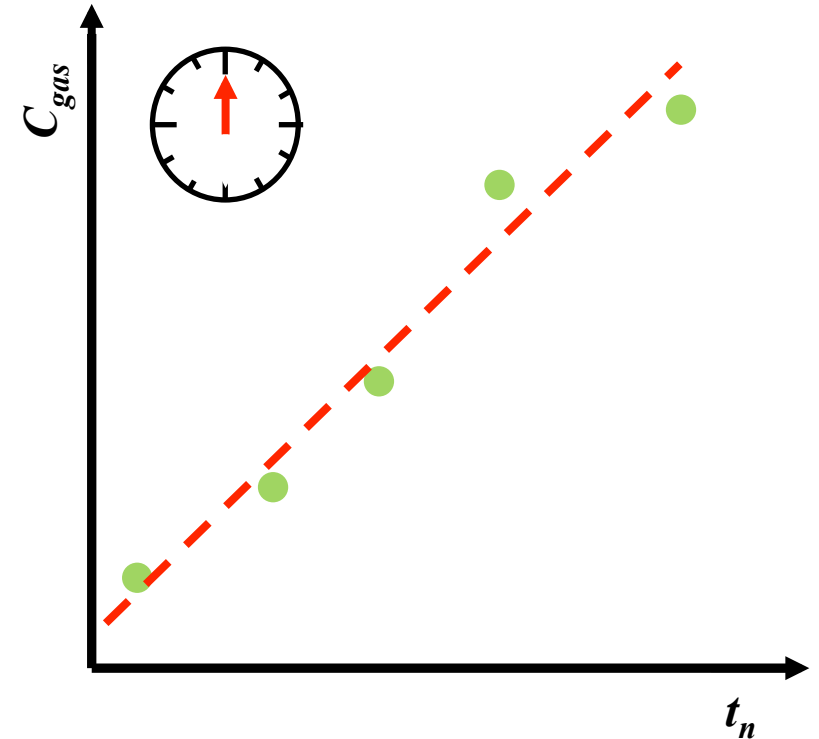
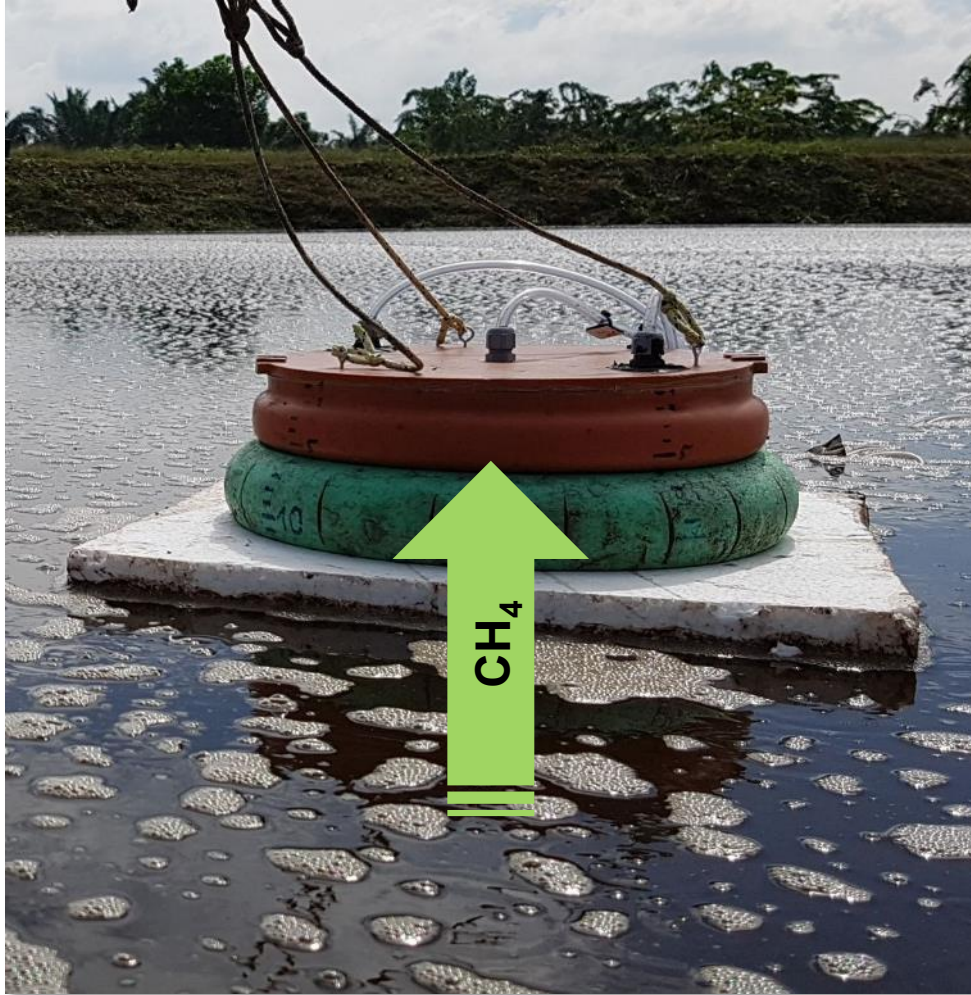


Design of measurement setup (III)

- For the day of CH₄-measurement of each pond, **COD (Chemical Oxygen Demand) samples** will be taken from 3 different depths (50cm, 150 cm, 300 cm) close to inlet and outlet of the ponds (= 6 COD samples per day)
- Water temperatures will be recorded with logging devices every 30 minutes in different depths (50cm, 150 cm, 300 cm) over several days in each pond



Chamber is placed over the pond surface and „catches“ the emitting gas



Assessing the CH₄ emission is based on identifying the increase of gas concentration over time within the chamber volume

$$r_{CH_4} [\mu g \cdot C \cdot m^{-2} \cdot h^{-1}] = \frac{M[g \cdot mol^{-1}] \cdot P[Pa] \cdot V[m^3] \cdot \delta v[ppm(v)] \cdot f_1}{R[m^3 \cdot Pa \cdot K^{-1} \cdot mol^{-1}] \cdot T[K] \cdot t[h] \cdot A[m^2]}$$

r_{CH_4} : Gas flux (e.g. CH₄)

M : molar mass

P : barometric pressure

V : chamber headspace (volume)

R : constant

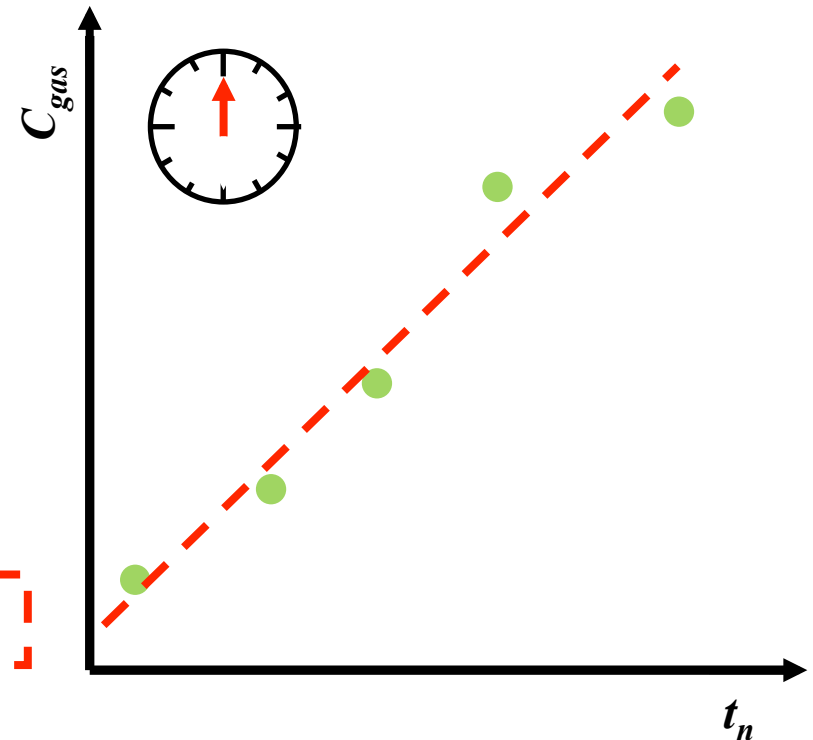
T : temperature

t : time

A : size of observed area

f_1 : elementary part of observed gas molecule

δv : observed slope of gas concentration c_{gas} over time t_n

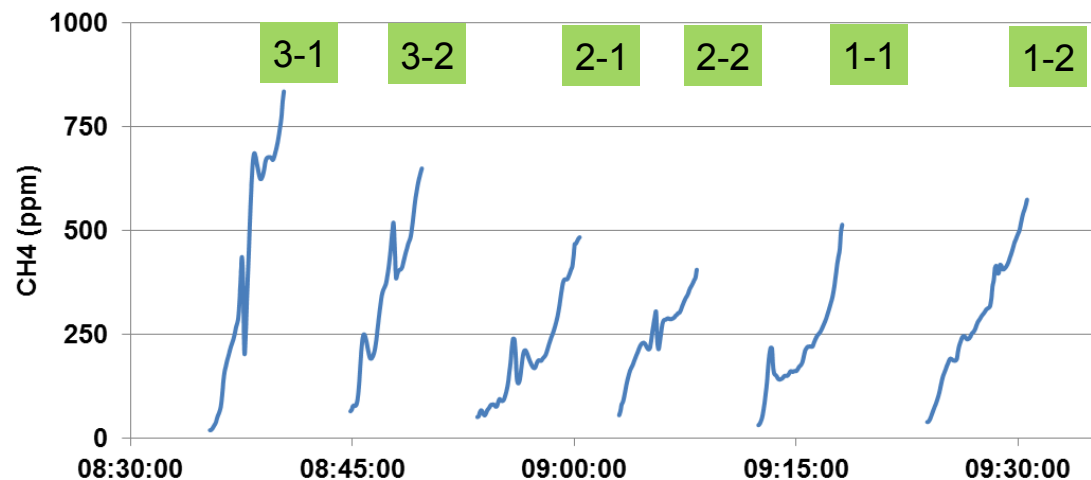


A first look into the data: Examples of different emission levels in the ponds (I)



- Preliminary results (as rough estimate!) from anaerobic pond 4 Inlet-Transect from November 30, 2016
- Average of 197.1 mg CH₄ m⁻² per hour
- → 47.3 kg CH₄ ha⁻¹ per day
- → Equals to 1.18 t of CO₂-equiv. ha⁻¹ per day

Anaerobic 4 Inlet-Transect

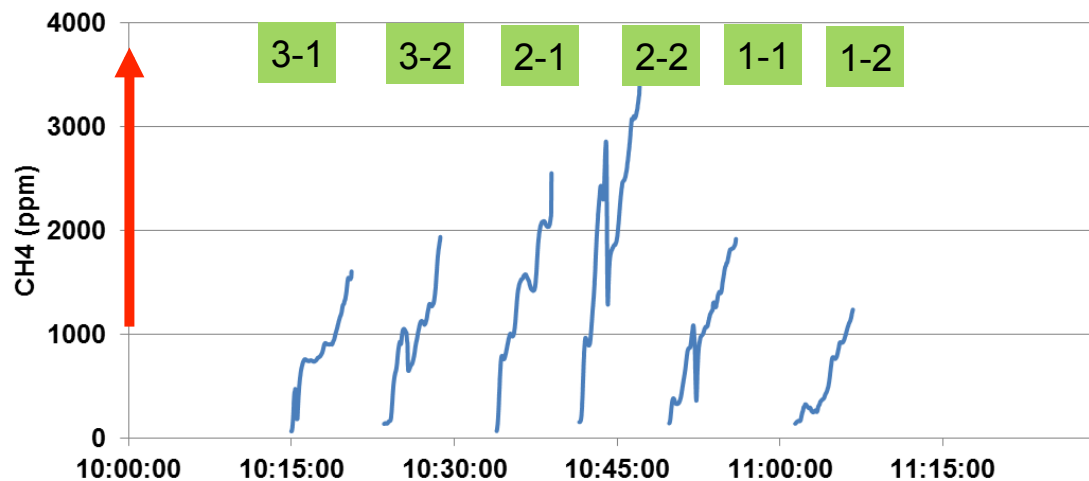


A first look into the data: Examples of different emission levels in the ponds (II)



- Preliminary results (as rough estimate!) from anaerobic pond 3 Middle-Transect from November 29, 2016
- Average of 615.8 mg CH₄ m⁻² per hour
- → 147.8 kg CH₄ ha⁻¹ per day
- → Equals to 3.69 t of CO₂-equiv. ha⁻¹ per day

Anaerobic 3 Middle-Transect





Many thanks for your attention!



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