

CHASY LOCO: low-cost measurement of GHG fluxes in tropical peatlands

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1 Background & Motivation

GHG flux measurement techniques exist for decades, but field measurements still rely on expensive analyzers. This is one of the reasons for the relatively low number of GHG exchange studies from tropical peatlands compared to temperate peatlands (Shao et al. 2023).

CHASY LOCO (chamber system low-cost) is a new device with the mission to make GHG flux measurements easily accessible by an affordable price and a user-friendly time-synchronized data collection.

All data are logged in one place with one timestamp, accessible via Bluetooth, SD card or USB. A whole setup for GHG flux measurement (including frames etc.) should become available for less than €1,000.

60,000€ vs <1,000€



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2 CHASY LOCO

CHASY LOCO (chamber system low-cost) consists of 3 parts: a chamber and a box, connected by a water-proof cable.

The **transparent PVC chamber (30x30x50 cm³)** contains besides a fan a PCB board with following low-cost sensors:

1. CO₂ (Senseair K30 FR),
2. CH₄ (Figaro TGS2611-C00),
3. rH and T_{air} (Sensirion SHT45),
4. p_{air} (Bosch BMP280)
5. PAR (ZALF development) (Hoffmann et al. 2025).

The lid can be closed manually, and the closed status is detected automatically by a limit switch. Optionally, the lid can also be closed and opened automatically by Nema 17 step motor and motor driver TB6600.

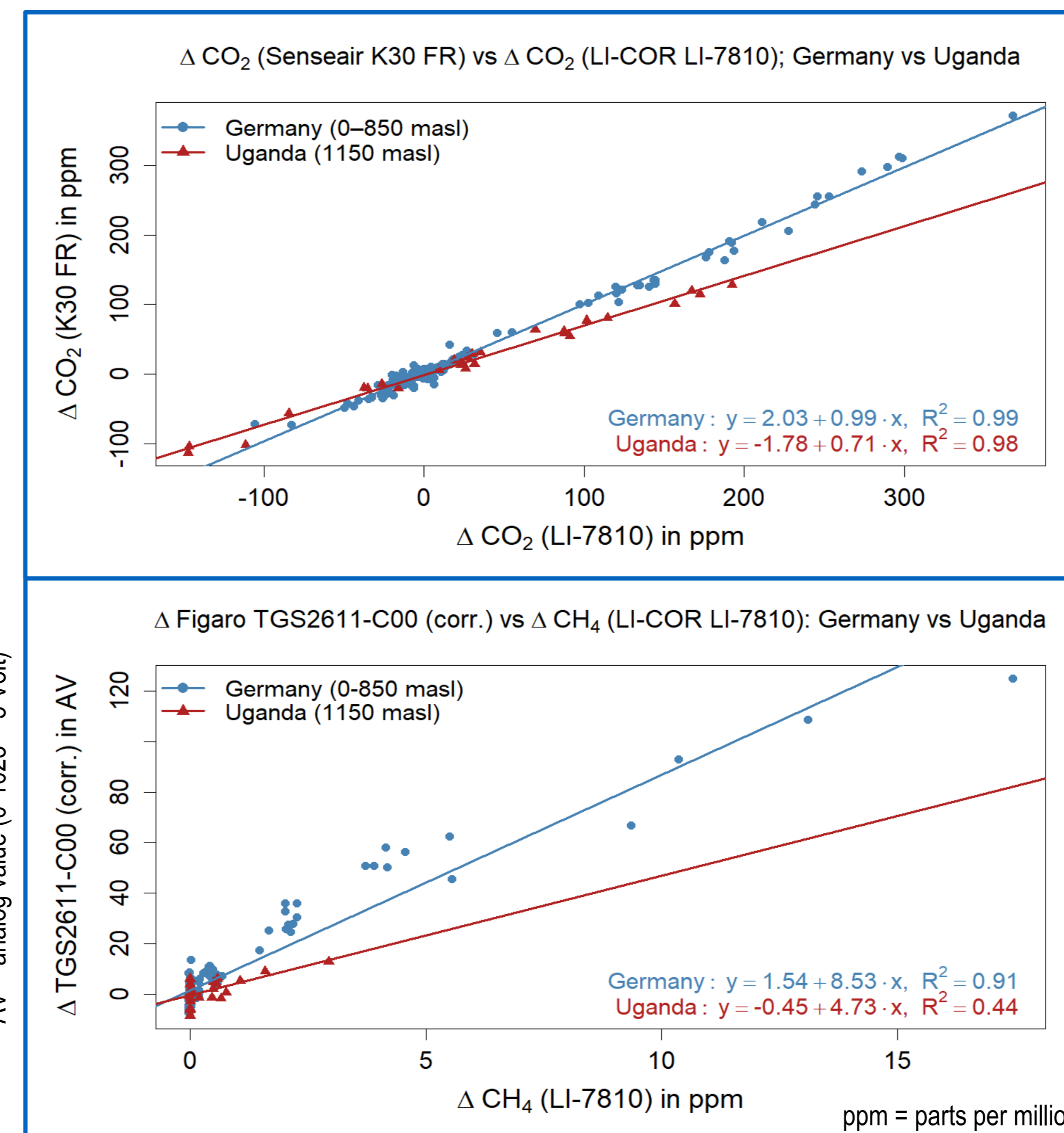
The **water-proof polypropylene box (23x18x9 cm³)** contains

1. Arduino Uno and data logger shield (Real Time Clock and SD card)
2. Bluetooth module HC-05
3. 12V lead-acid battery (7.2 Wh)

An extra stacking chamber (30x30x50 cm³) can be included to enclose larger plants. Both chambers fit in well-transportable cajon backpacks.

3 Preliminary Results

The low-cost sensors were compared to the high-cost sensor LI-7810. K30 FR works well (Macagga et al. 2024) but needs to be **adjusted to altitude**. TGS2611-C00 needs correction for **cross-sensitivity to H₂O**.



4 Knowledge transfer within Peat4People

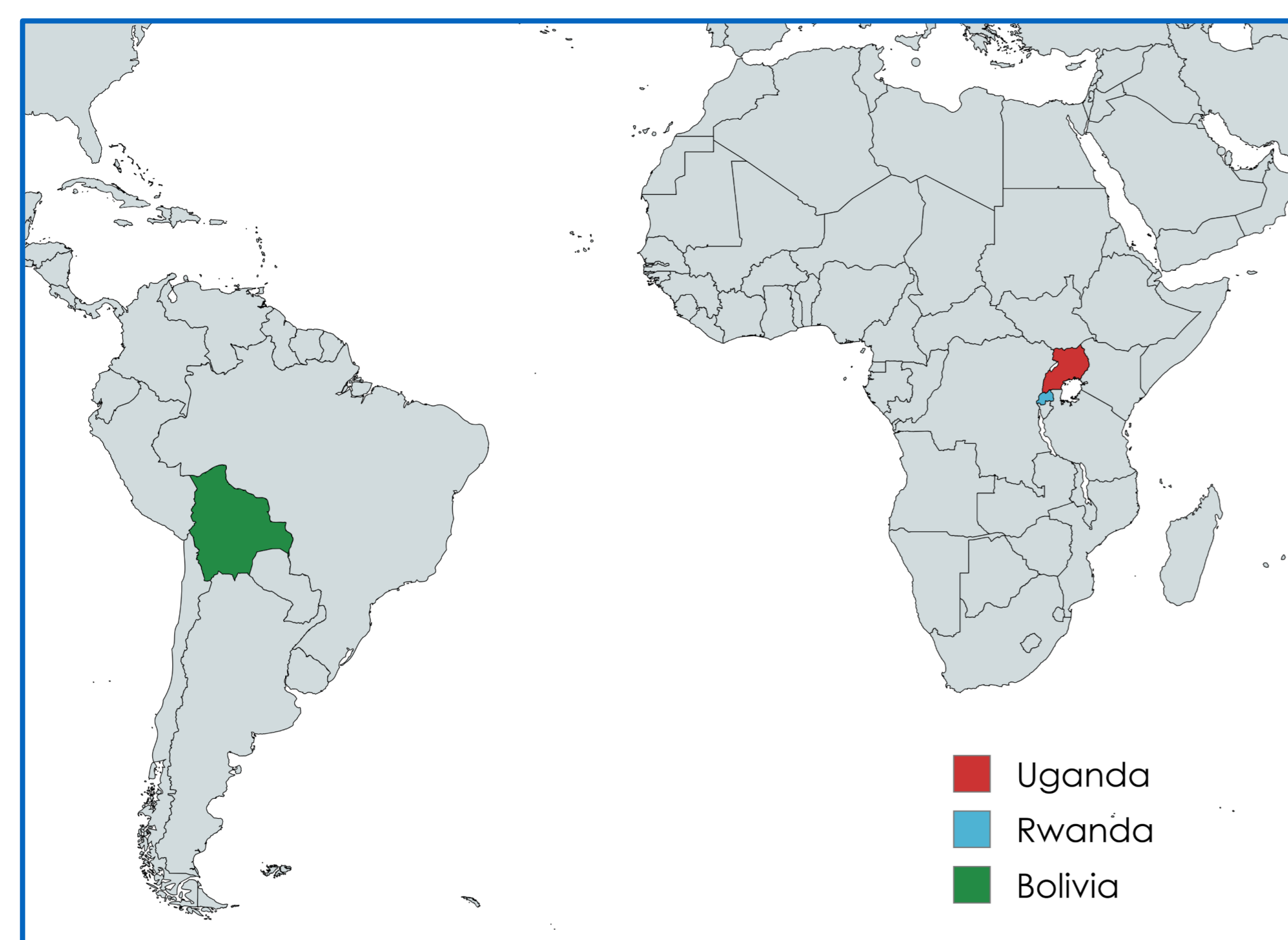
The international project Peat4People* aims to improve knowledge about peatlands of Uganda and Rwanda and their sustainable use.

In January/February 2026, a CHASY LOCO course was given at ZALF to train researchers from Uganda and Rwanda about low-cost GHG flux measurements for **future peatland emission factors**. Each participant could construct one manual (for spatial variability) and one automatic (for temporal variability) CHASY LOCO.

In March 2026, a field trip to Uganda and Rwanda took place to choose measurement sites and prepare long-term measurements. CHASY LOCO was successfully tested under tropical conditions.

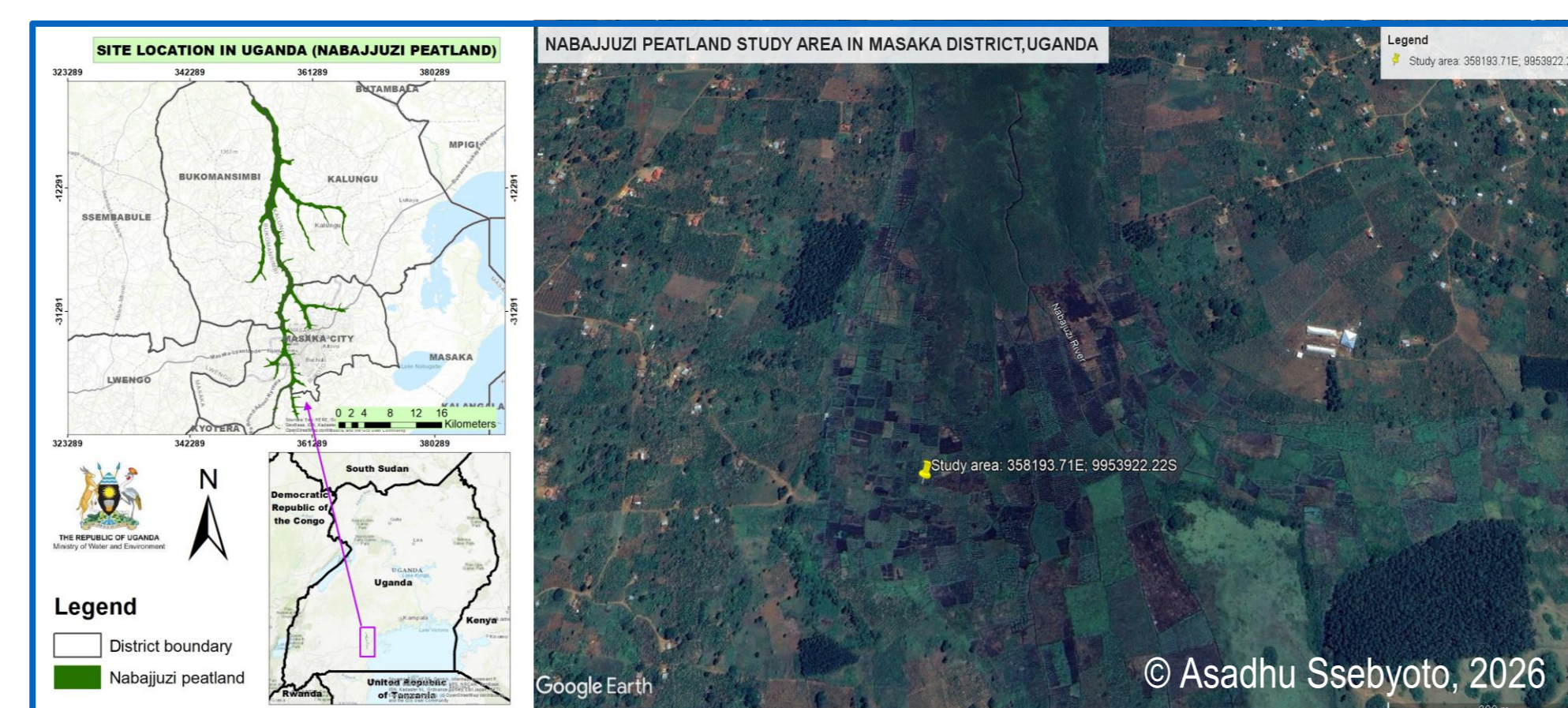


THE TROPICAL PEATLAND SITES



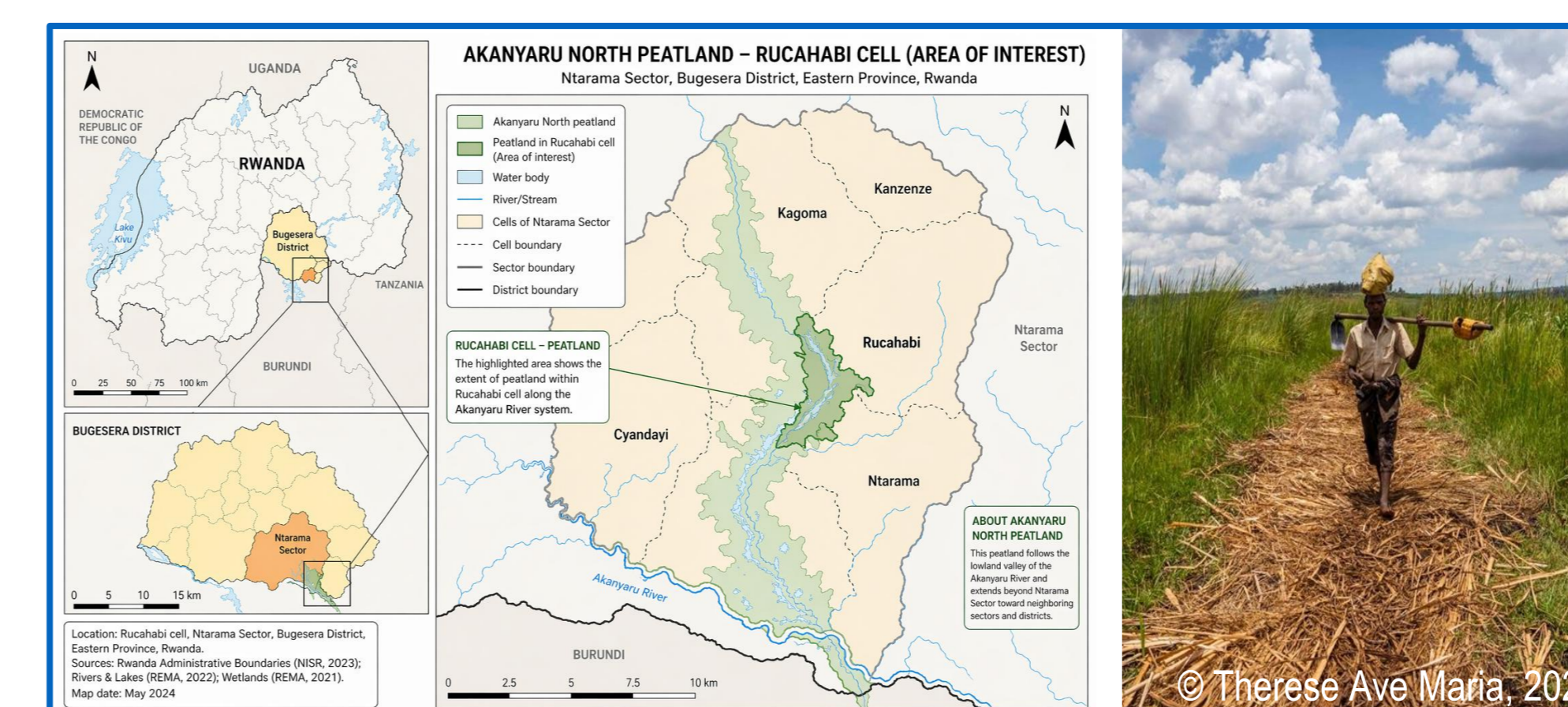
Nabajuzi peatland in Masaka (Uganda)

Nabajuzi peatland is a Ramsar site showing its importance to biodiversity and livelihoods of surrounding communities. The vegetation is dominated by *Cyperus papyrus* and *Loudetia sp.*; the site is source of raw materials for crafts and mulching, fish, domestic water and water for livestock. Major threats are agriculture, settlements, overgrazing and deforestation.



Rucahabi peatland in Ntarama (Rwanda)

Rucahabi peatland is dominated by *Cyperus papyrus* and *Typha sp.* It is important for carbon storage and ecosystem functioning, currently affected by drainage and subsistence agriculture. It serves as a Peat4People demonstration site for greenhouse gas monitoring and the development of restoration and sustainable management practices.



In 2026, CHASY LOCO is used in tropical peatlands of three countries: Uganda, Rwanda and Bolivia. The study sites in Bolivia will probably be in the North of La Paz at 4000-5000 masl. Planned to begin the field research in August 2026, the goal is to gain the first GHG balances from Andean peatlands (bofedales) in the country (as of 26.04.26).

References

Hoffmann et al. (2025): Build-It-Yourself: Low-Cost Systems for Field Ecophysiology An Open Handbook for DIY Environmental Measurement Systems. <https://zenodo.org/records/15669850>

Macagga et al. (2024): Validation and field application of a low-cost device to measure CO₂ and evapotranspiration (ET) fluxes. <https://amt.copernicus.org/articles/17/1317/2024/>

Shao et al. (2023). Global observation gaps of peatland greenhouse gas balances: needs and obstacles. <https://link.springer.com/article/10.1007/s10533-023-01091-2>

* GIZ (2025). Promoting sustainable peatland management for people, climate and biodiversity. <https://www.giz.de/en/projects/sustainable-peatland-management-people-climate-and-biodiversity-peat4people>

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