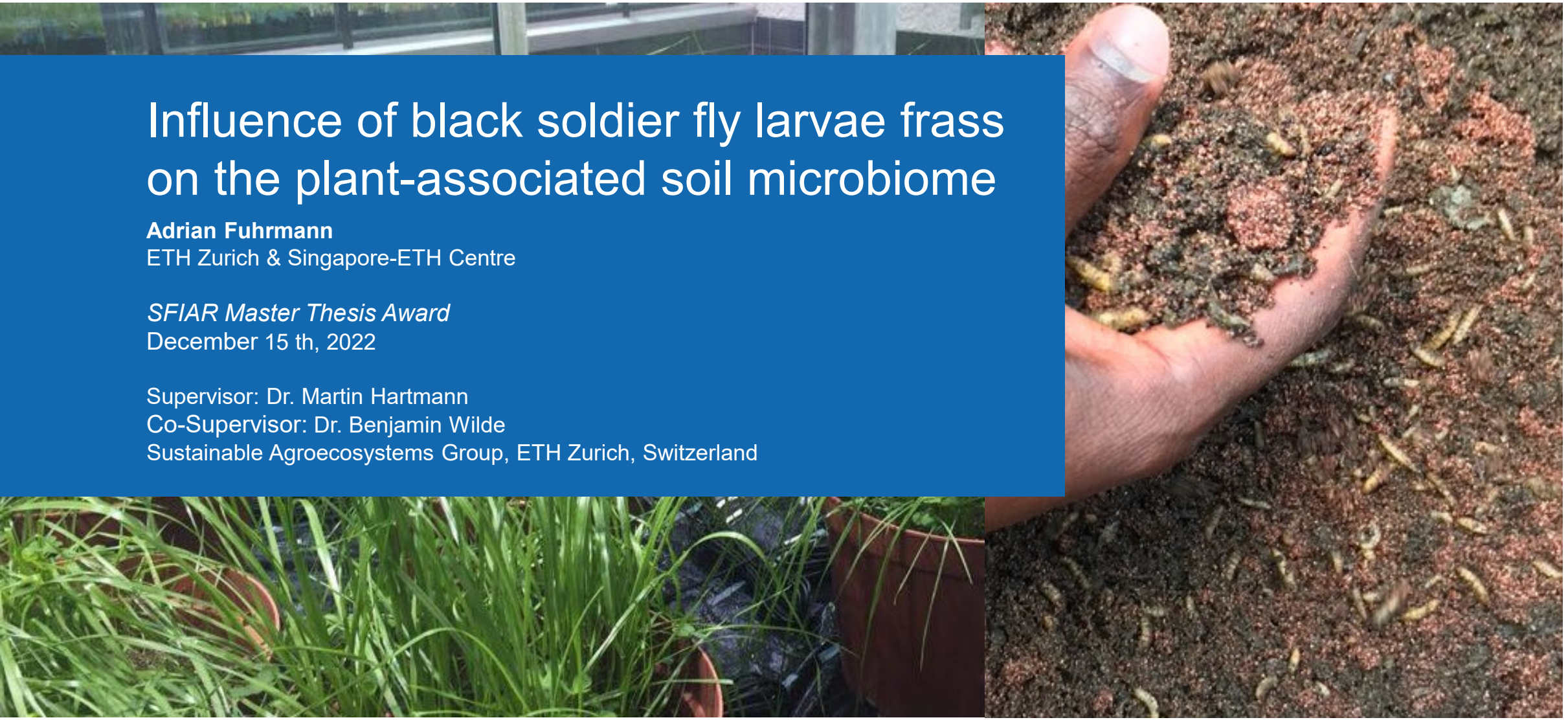
Influence of black soldier fly larvae frass on the plant-associated soil microbiome

Adrian Fuhrmann
ETH Zurich & Singapore-ETH Centre

SFIAR Master Thesis Award
December 15 th, 2022

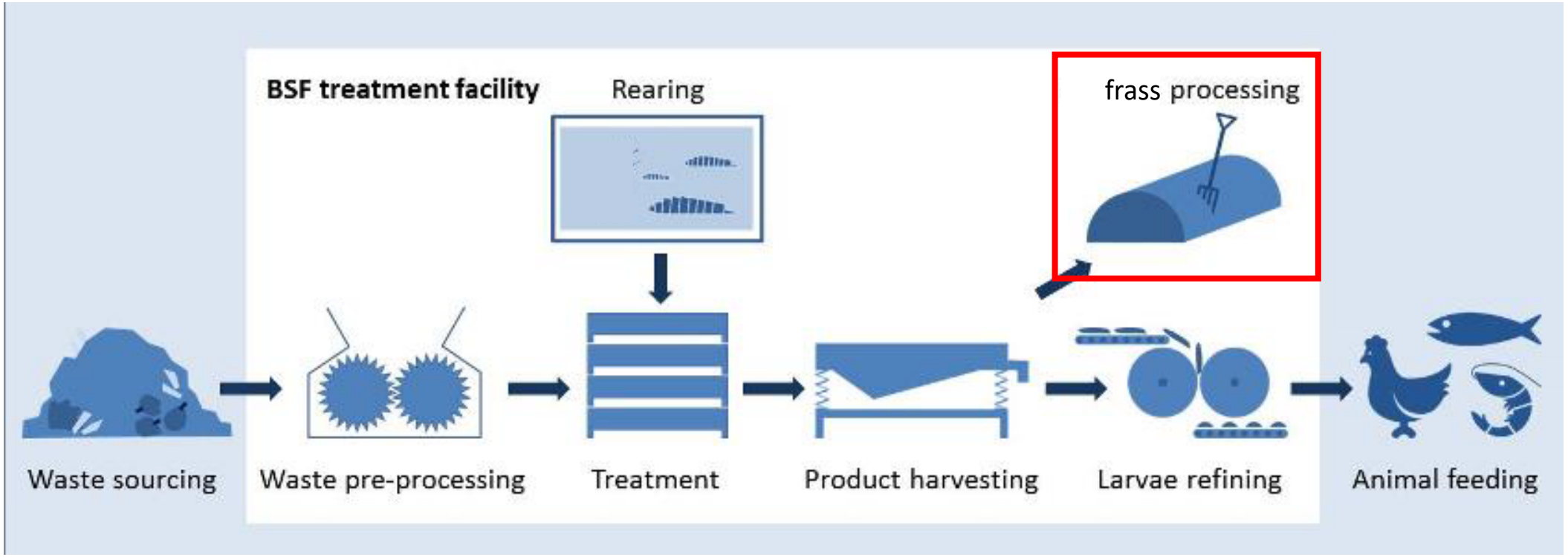
Supervisor: Dr. Martin Hartmann
Co-Supervisor: Dr. Benjamin Wilde
Sustainable Agroecosystems Group, ETH Zurich, Switzerland



(© Mélanie Surchat)

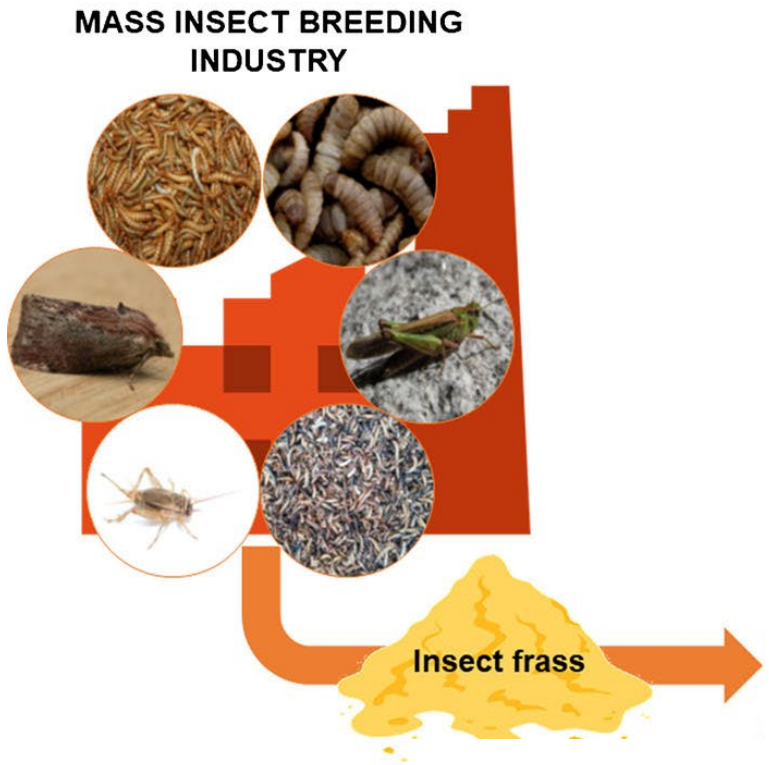
Black soldier fly larvae rearing

to close the loop in the food system



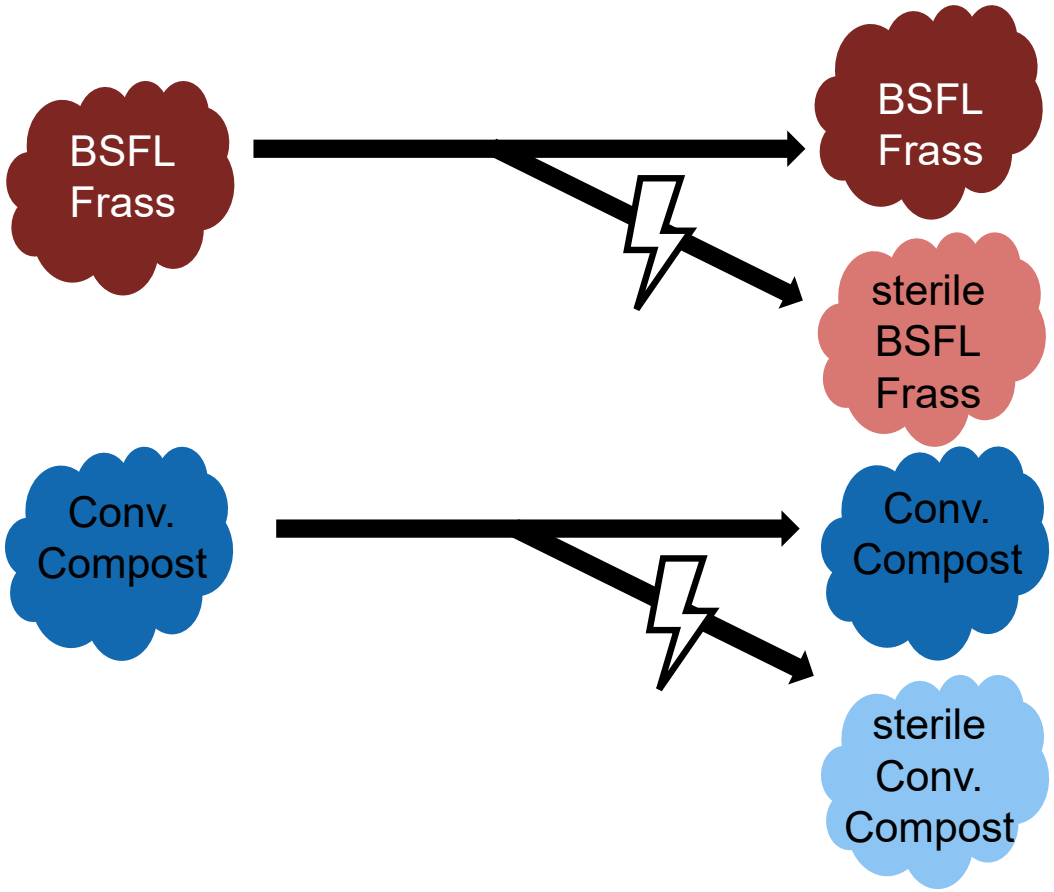
(adapted from Black Soldier Fly Biowaste Processing - A step-by-step guide, Eawag, 2017)

Frass and the plant-associated soil microbiome



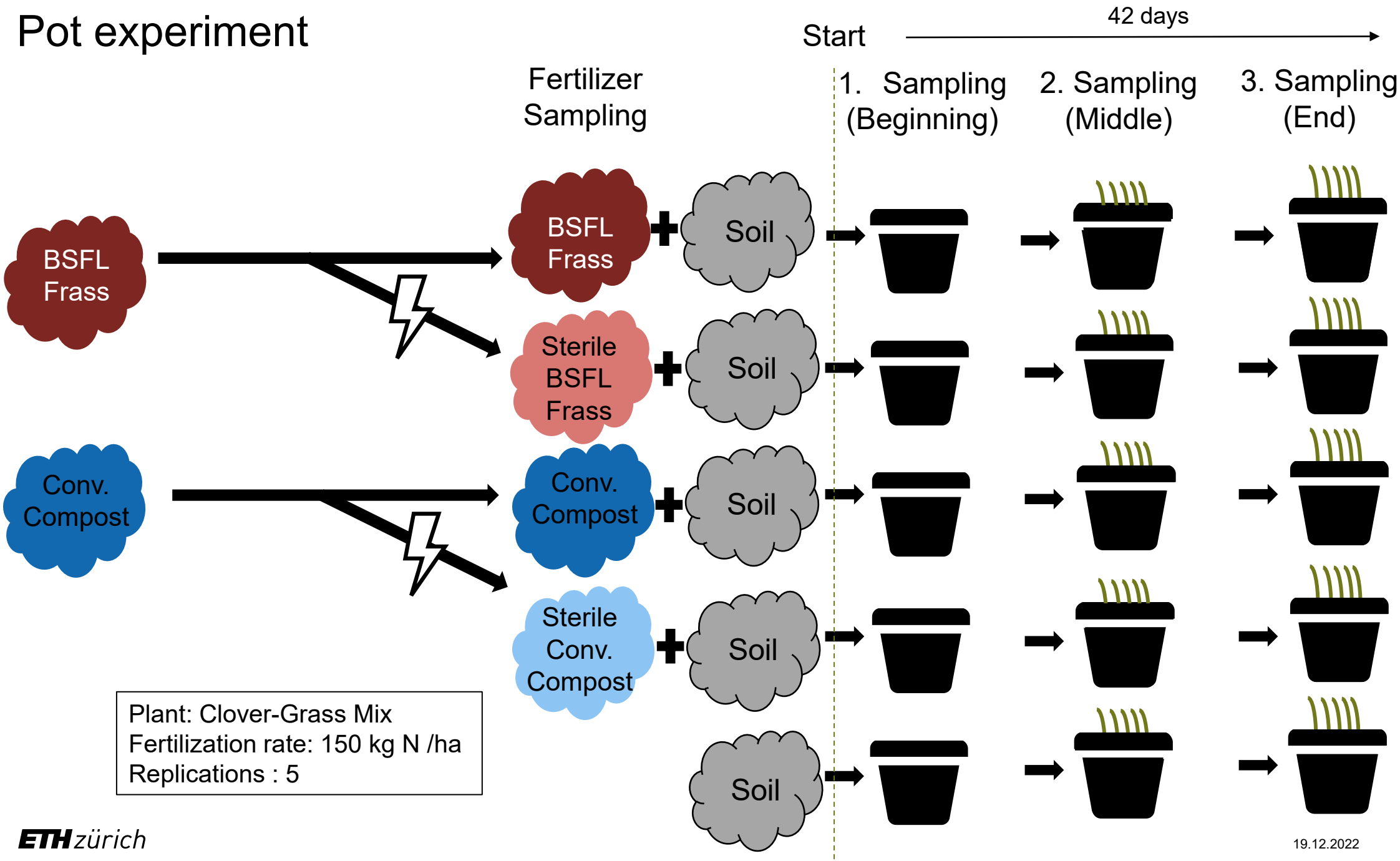
(adpated from Poveda, 2021)

Origin of fertilizers



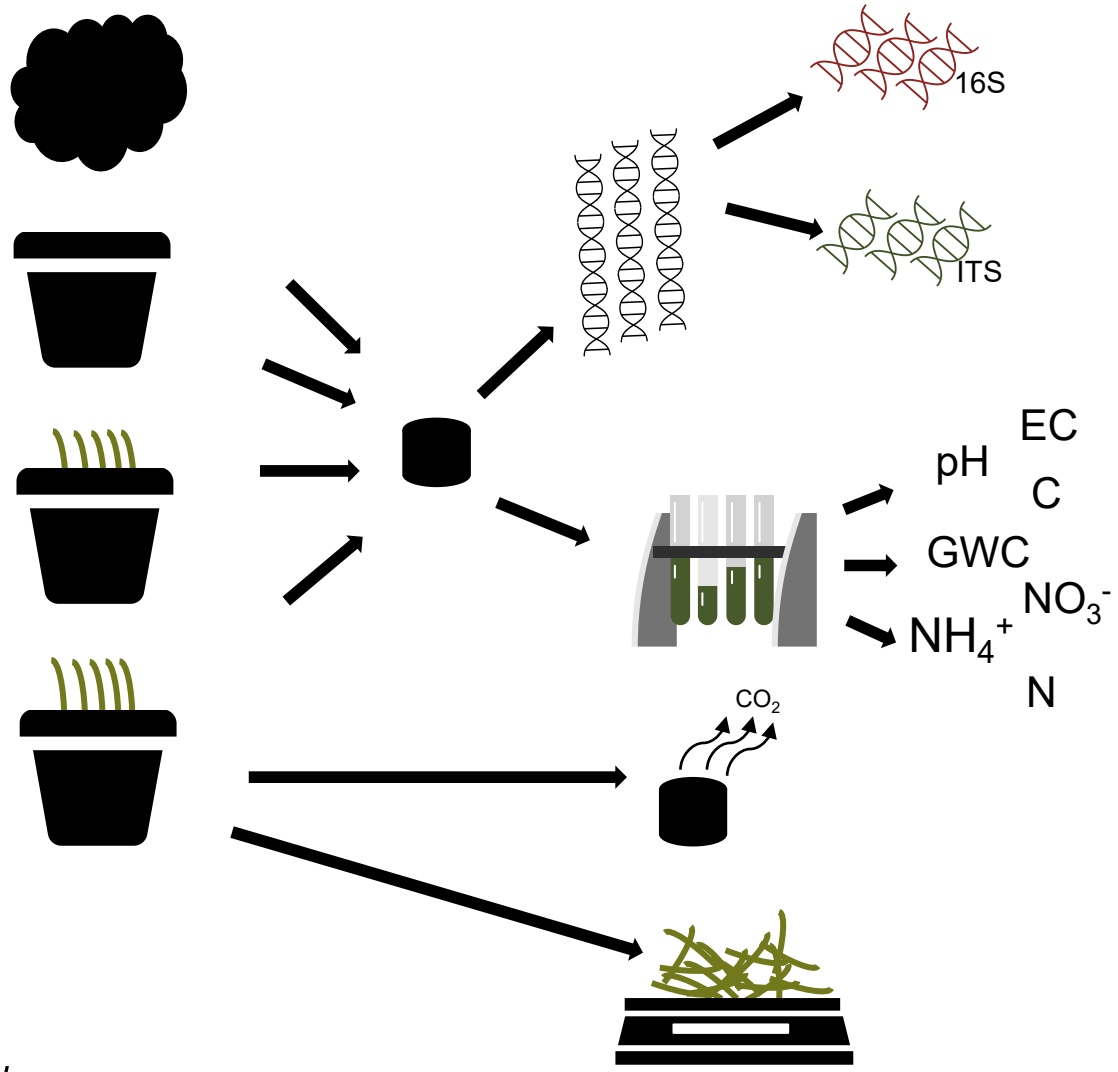
RUNRES

Pot experiment



Plant: Clover-Grass Mix
Fertilization rate: 150 kg N /ha
Replications : 5

Sample analysis



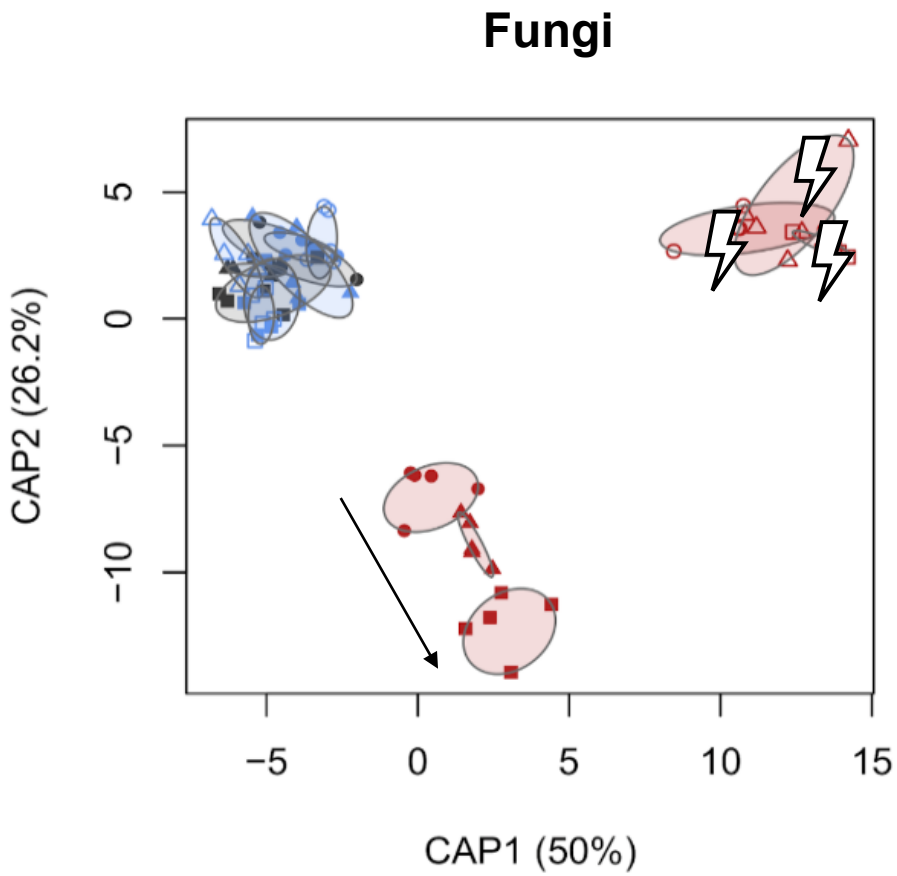
Sequencing of Bacterial and Fungal Taxa

Physicochemical Analysis

Determination of Basal Respiration

Determination of Plant Yield

Differences in **soil** microbial community compositions



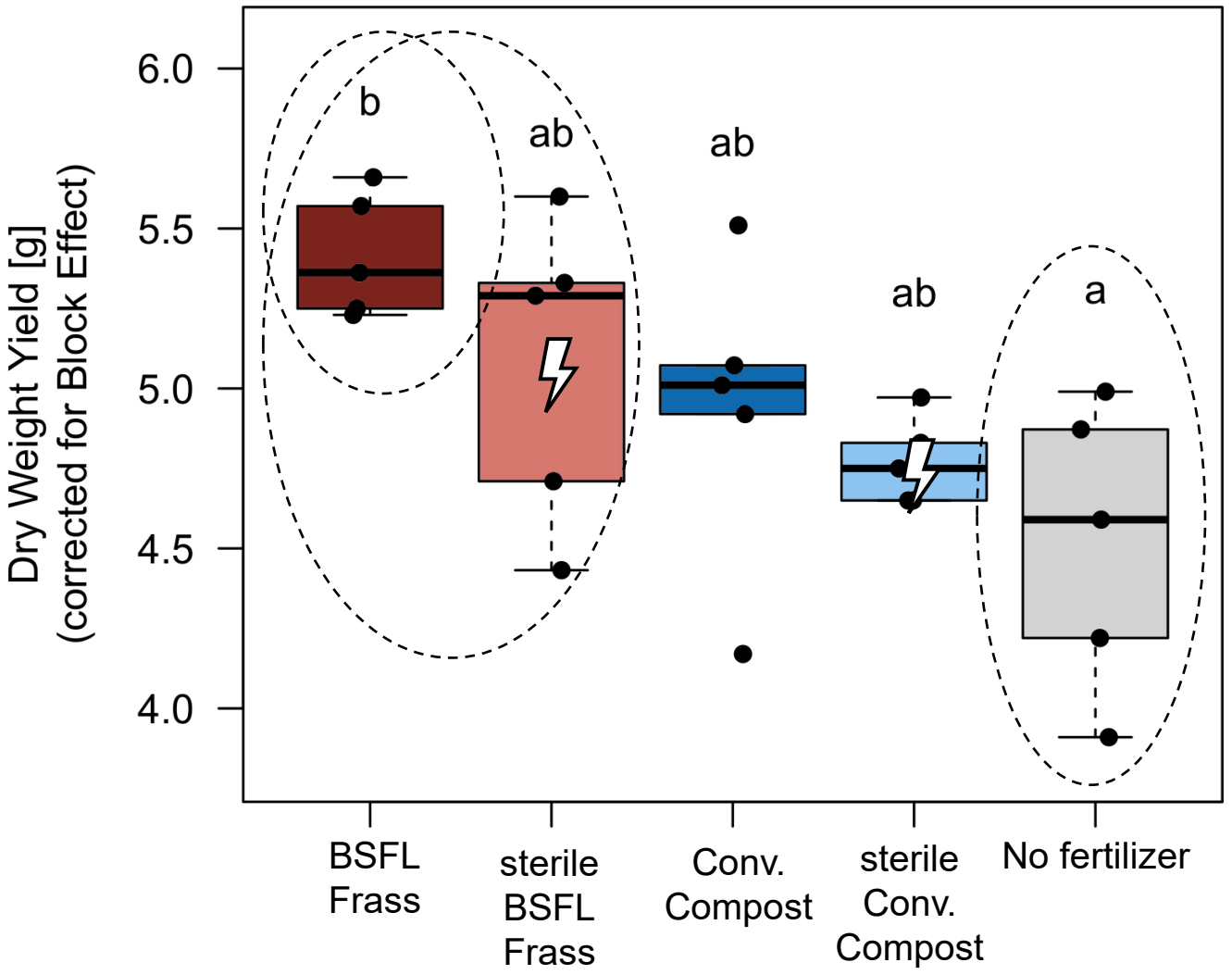
Fertilized with:
- BSFL Frass
- Conv. Compost
- No fertilizer

- non-sterile fertilizer
- sterile fertilizer

Sampling time:
- Beginning
- Middle
- End

(Fuhrmann et al., 2022)

Plant Yield



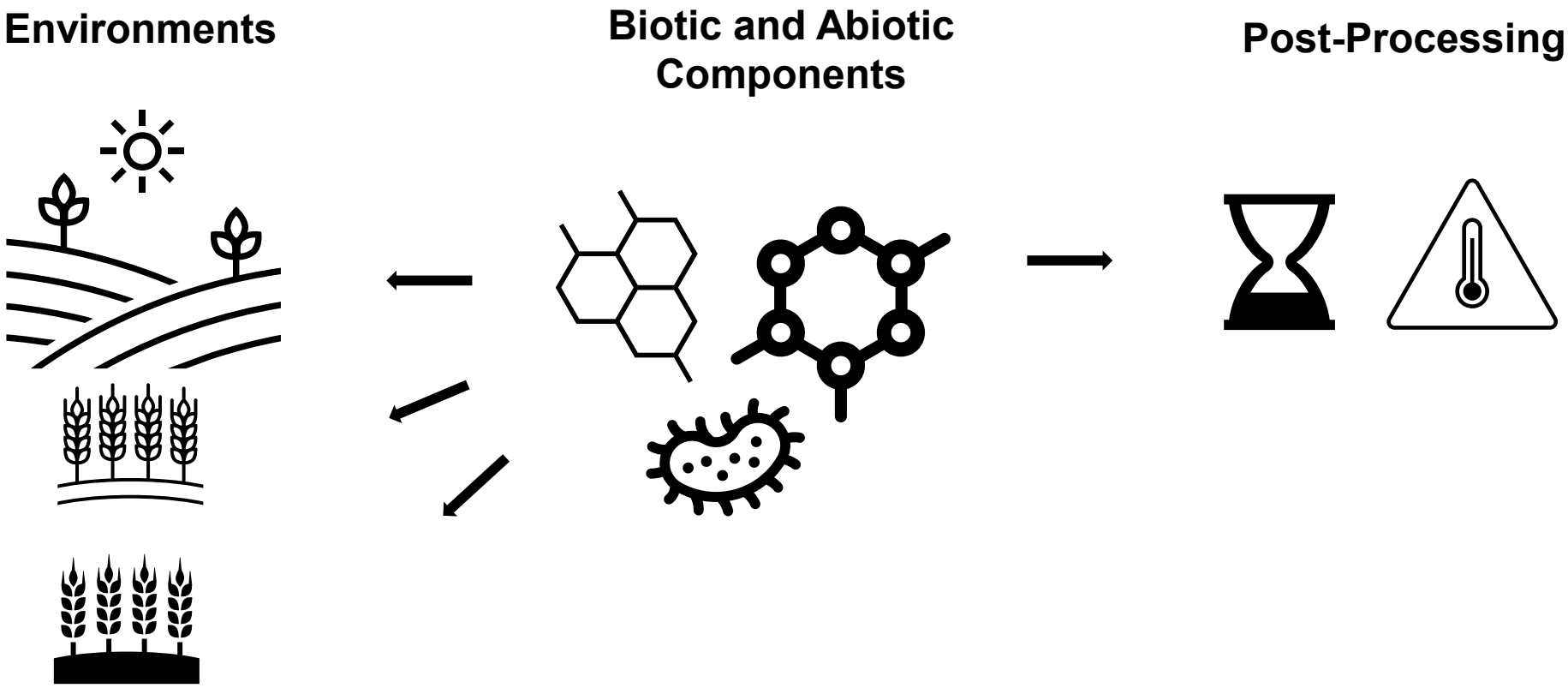
Distinct letters on top of bars indicate significant differences

(Fuhrmann et al., 2022)

Take home messages

- BSFL frass influenced the plant-associated soil microbial community composition
  - the impact was **stronger compared to a conventional compost**

Outlook


Environments
Biotic and Abiotic Components
Post-Processing

Acknowledgements

Supporters:
Speciose Kantengwa
Matieyedou Konlambigue
Barthazar Masengesho
Moritz Gold
Alexander Mathys
Johan Six
Rafaela Feola Conz
Leonard Späth
Melanie Surchat
Matti Barthel
Astrid Jaeger
Brigitta Herzog
Britta Jahn-Humphrey

IITA
Transforming African Agriculture

Sustainable Agroecosystems

RUNRES

SFP
SUSTAINABLE FOOD PROCESSING

LEONI

(SEC) SINGAPORE-ETH CENTRE

Functional Genomics Center Zurich

NATIONAL RESEARCH FOUNDATION
PRIME MINISTER'S OFFICE SINGAPORE

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

References

- Poveda, J. (2021). "Insect frass in the development of sustainable agriculture. A review." Agronomy for Sustainable Development **41**(1): 1-10.
- Fuhrmann, A., Wilde, B., Conz, R. F., Kantengwa, S., Konlambigue, M., Masengesho, B., ... & Hartmann, M. (2022). Residues from black soldier fly (Hermetia illucens) larvae rearing influence the plant-associated soil microbiome in the short term. *Frontiers in microbiology*, 3783.