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Education and Research EAER

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The Swiss agri-environmental data network (SAEDN)

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Agri-environmental monitoring in Switzerland

- Based on the Law on Agriculture, the Swiss government needs to **monitor** the **economical**, **social**, and **ecological** situation in agriculture
- Periodic assessment of the development of the ecological performance of farms and the impact of agriculture on natural resources

→ Agri-environmental monitoring

- Enforced by the Federal Office for Agriculture
- Executed by Agroscope

→ Assessment of effects of agricultural policy based on **national**, **regional** and **farm-level** agri-environmental indicators (AEIs)

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Agri-environmental monitoring in Switzerland

	Driving forces Agricultural practice	Environmental impact Agricultural process	Environmental status
Nitrogen (N)	Agricultural N-Balance	Potential N-losses Ammonia emissions	Nitrate in groundwater
Phosphorus (P)	Agricultural P-Balance	P content in soils	P pollution in lakes
Energy / Climate	Energy consumption	Energy efficiency Greenhous gas emissions	
Water	Usage of plant protection products (PPP)	Risk of aquatic ecotoxicity	PPP in groundwater
Soil	Soil cover	Erosion risk Humus balance Heavy metal balance	Pollutant content Soil quality
Biodiversity / Landscape	Biodiversity promotion areas	Potential impacts of agricultural activities on biodiversity	Species and habitats in agriculture (ALL-EMA) Landscape observation

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Swiss agri-environmental data network (SAEDN)

- Calculate environmental indicators on **farm/crop level** in order to aggregate on **region** and **farm type level**

- From 2009-2022, the SAEDN has **collected management data** and **calculated AEIs** on **farm** or **crop level**

- Originally, only farms participating in FADN also provided data for the SAEDN
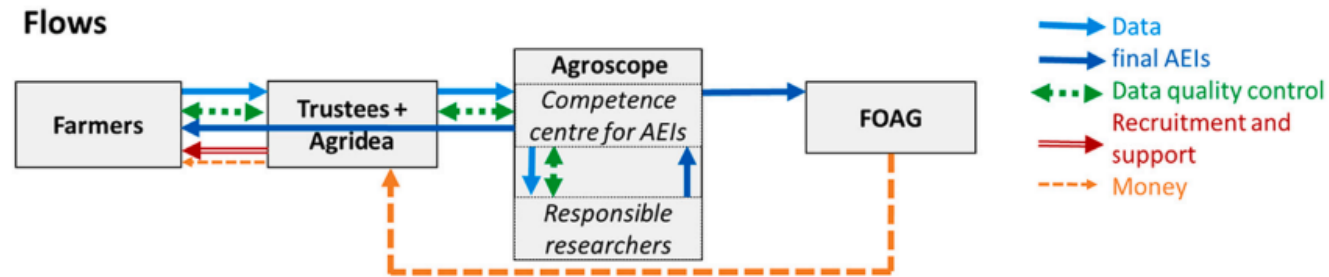
- Around 300 farms provide annually data to the SAEDN
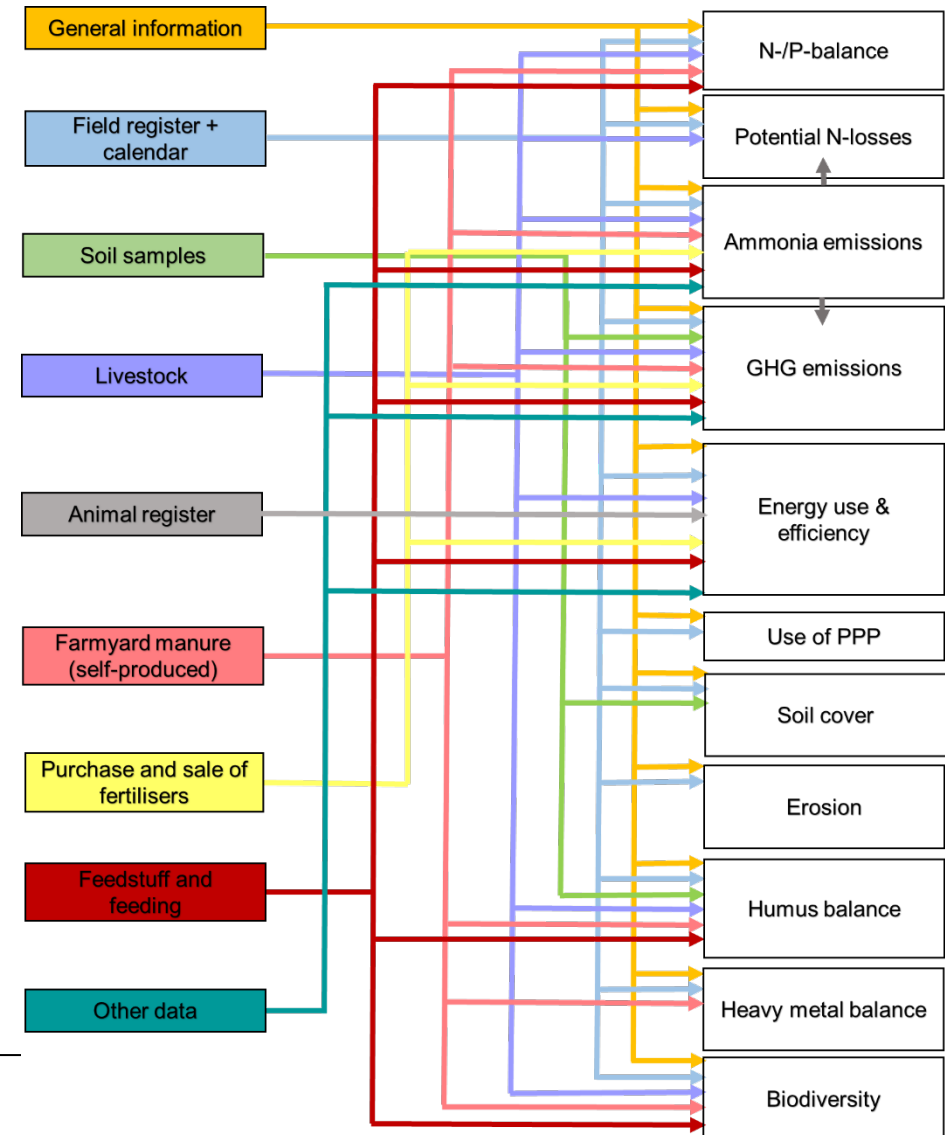
Gilgen et al. (2023)

Swiss agri-environmental data network (SAEDN)

- Data delivery over a specific software via trustees agencies

Fig. 1. Flow chart and time frame of data to calculate the AEIs for year t. Since 2016, Agridea has also taken on the role of a trustee agency. AEIs = Agri-environmental indicators, FOAG = Federal office of agriculture.
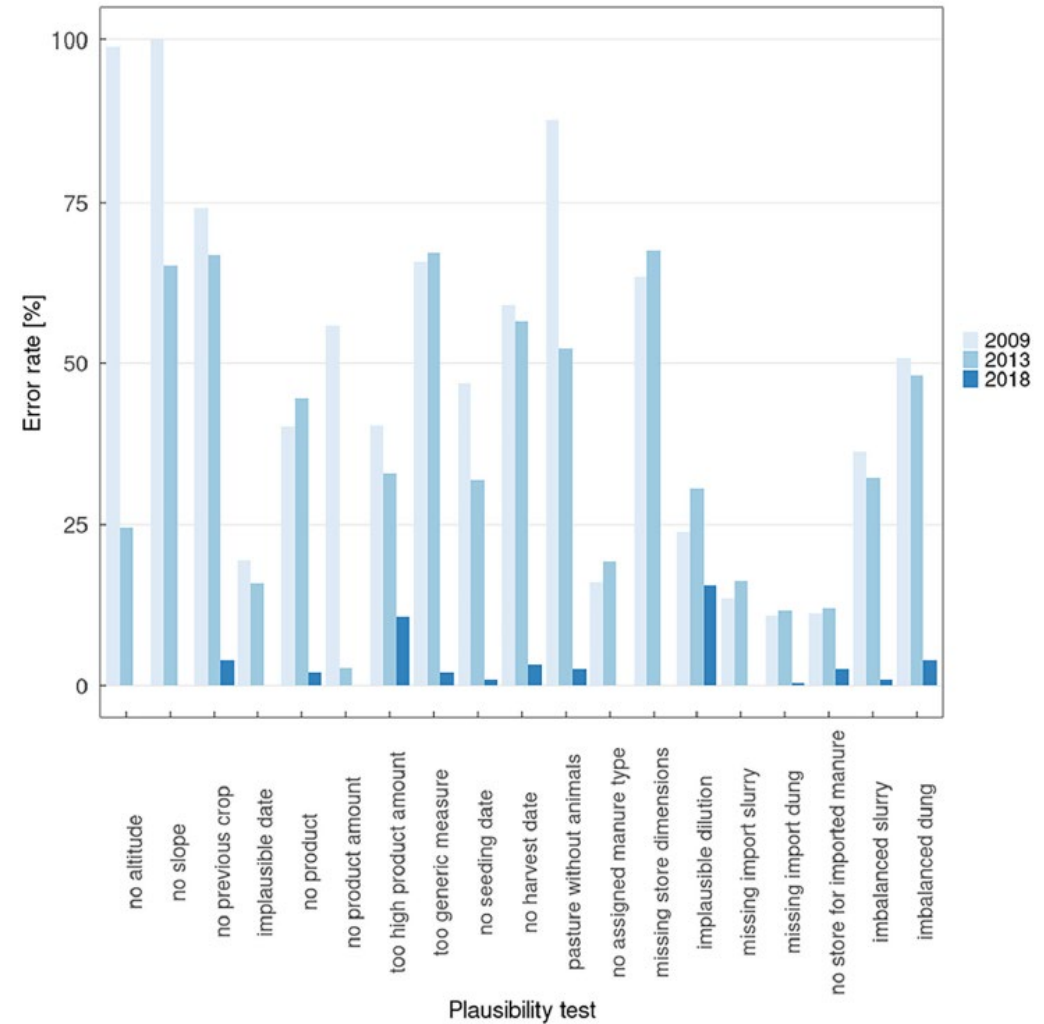
Gilgen et al. (2023)

Swiss agri-environmental data network (SAEDN)

Quality check of data

- Huge amount and high complexity of data does not allow manual check of each entry
- Since 2014 automated plausibility tests to detect missing/suspicious data
- Errors still possible (e.g. missing entries of fertilizer applications)

Gilgen et al. (2023)

Swiss agri-environmental data network (SAEDN)

Results

- Annually published in the agricultural report by FOAG
- Every participant gets an individual feedback on the agri-environmental performance of its farm compared to the other participants
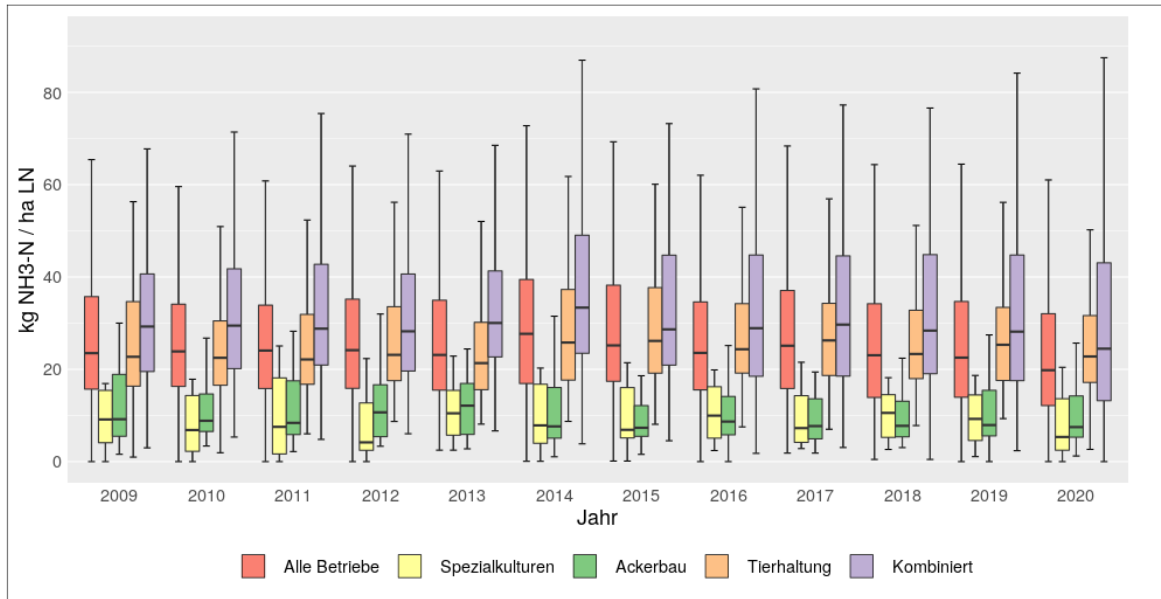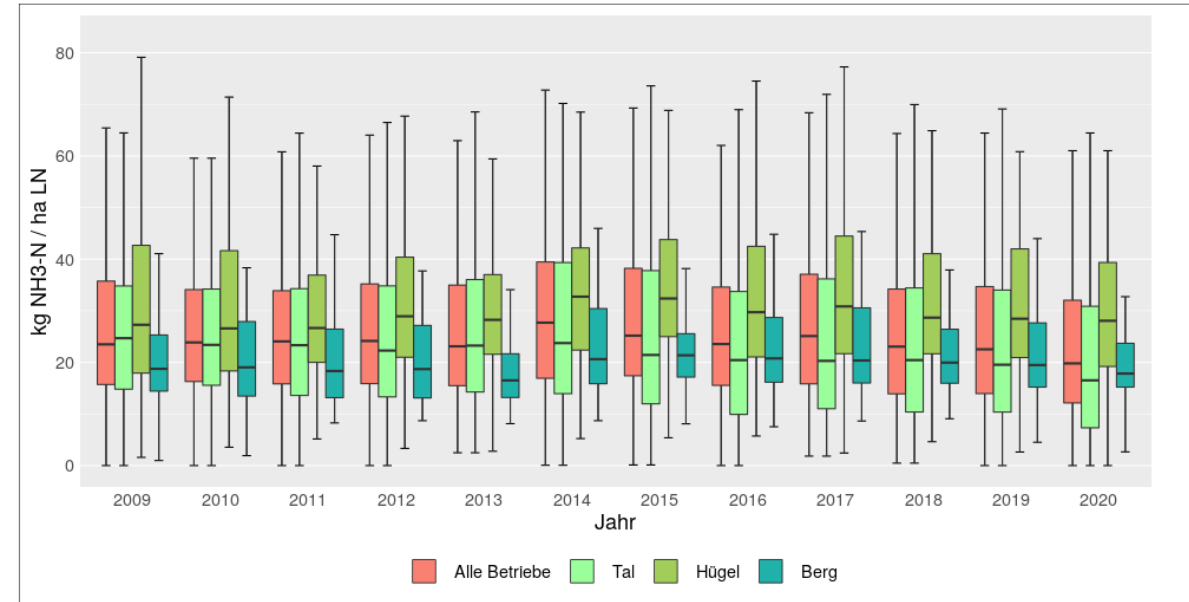- Published on a web-based shiny application
  https://apps.agroscope.info/sp/za-aui/2/app/datenreihe?lang=D

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Swiss agri-environmental data network (SAEDN)

- Results: example ammonia emissions

Future of the agri-environmental monitoring in Switzerland

- In 2022 last data collection for the SAEDN
  - Only ~300 farms → not a representative sample size
  - Data delivery very time consuming for farmers

→ New agri-environmental monitoring system from 2023 onwards (MAUS)

- AEI calculation on farm level for whole Switzerland
- Based on existing data
- Incorporating new data sources and technologies (FMIS, satellite data)

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New agri-environmental monitoring (MAUS)

Data sources

- Agricultural Policy Information System (AGIS)
  - Contains every farm that receives direct payments
  - Information on: livestock, main crops, utilized agricultural area, production form (organic vs. conventional), resource efficiency contributions
- Georeferenced land use data
- Farmyard manure shifts database (HODUFLU)
- Yield data from various industry associations
- Yield data from the FADN
- And others

→ Challenge to connect all different data sources

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New agri-environmental monitoring (MAUS)

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- AEI calculation for every farm in Switzerland → easy upscaling for desired level (region, canton, zone, etc.)
- Based on existing data → no extra work for farmers

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- Adaption of models necessary
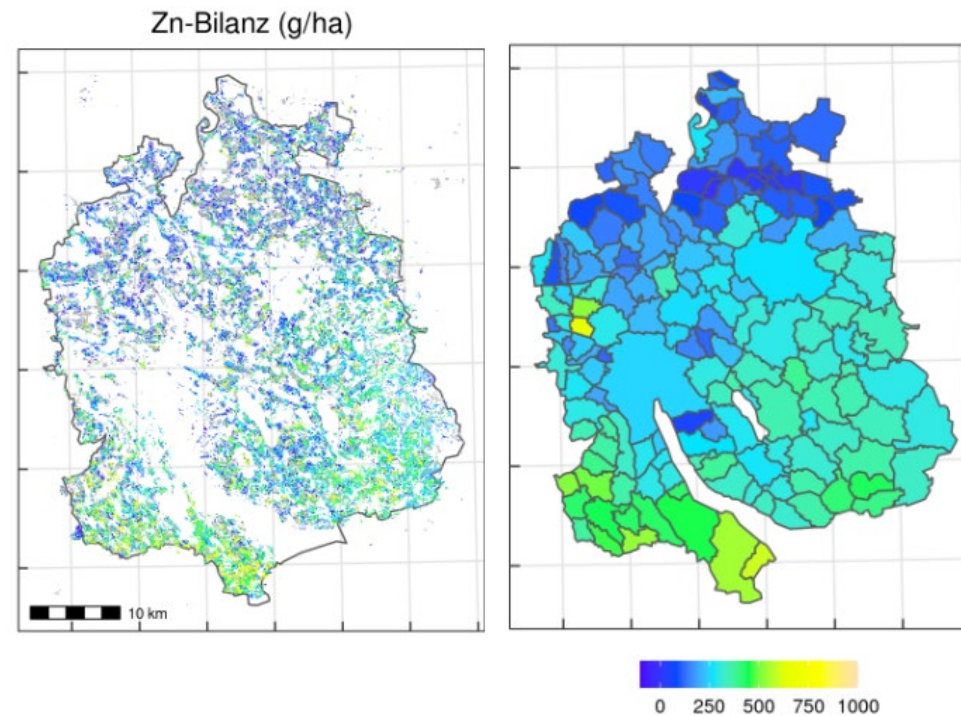- Existing data is not precise enough, especially farm management data is missing

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- 2024: Getting management data from farm management information systems (FMIS)
- 2024: Conducting extra surveys
- 2025: Using remote sensing technology (satellite) to fill in missing data

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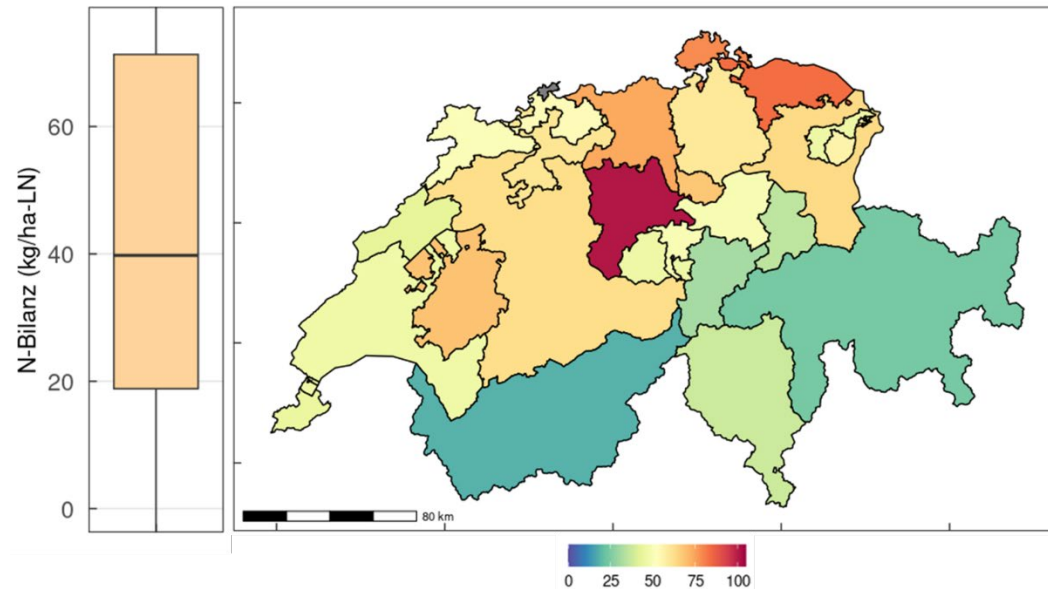# New agri-environmental monitoring (MAUS)

Preliminary results – Heavy metal balance

# New agri-environmental monitoring (MAUS)

Preliminary results – nitrogen balance
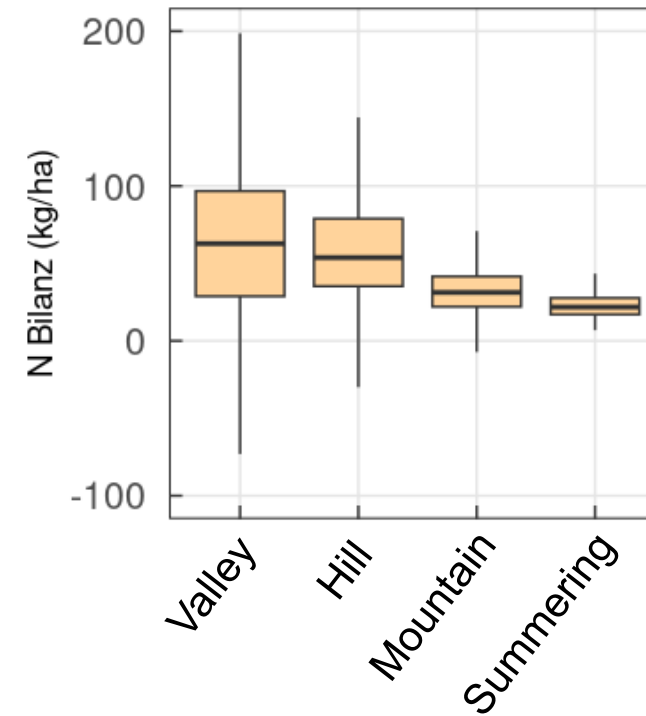
Summary

- From 2009 – 2022: Swiss agri-environmental data network (SAEDN)
  - ~300 farms annually
  - Calculation of several agri-environmental indicators covering different topics
  - High data quality control necessary

- From 2023: New agri-environmental monitoring (MAUS)
  - AEIs for whole Switzerland
  - Based on existing data + additional data collections/incorporations using new technologies (FMIS, satellite)
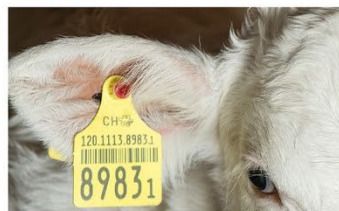 - Different data sources→ adjustment of models
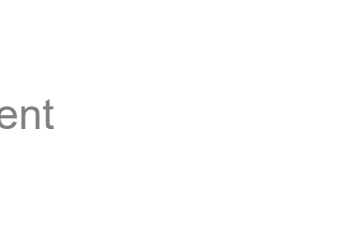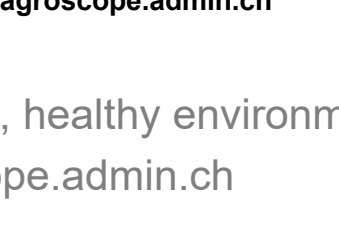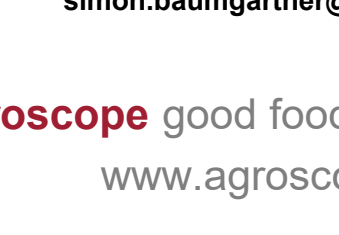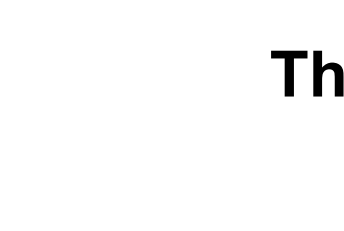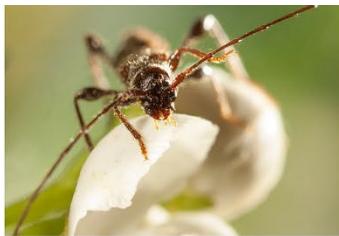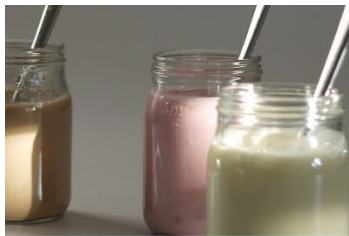
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Thank you for your attention

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References

Gilgen A., Blaser S., Schneuwly J., Liebisch F., Merbold L. (2023). The Swiss agri-environmental data network (SAEDN): Description and critical review of the dataset. *Agricultural Systems*, 205, p. 103576.

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