

# Agroecological assessments as an opportunity for more resilient and sustainable livestock systems

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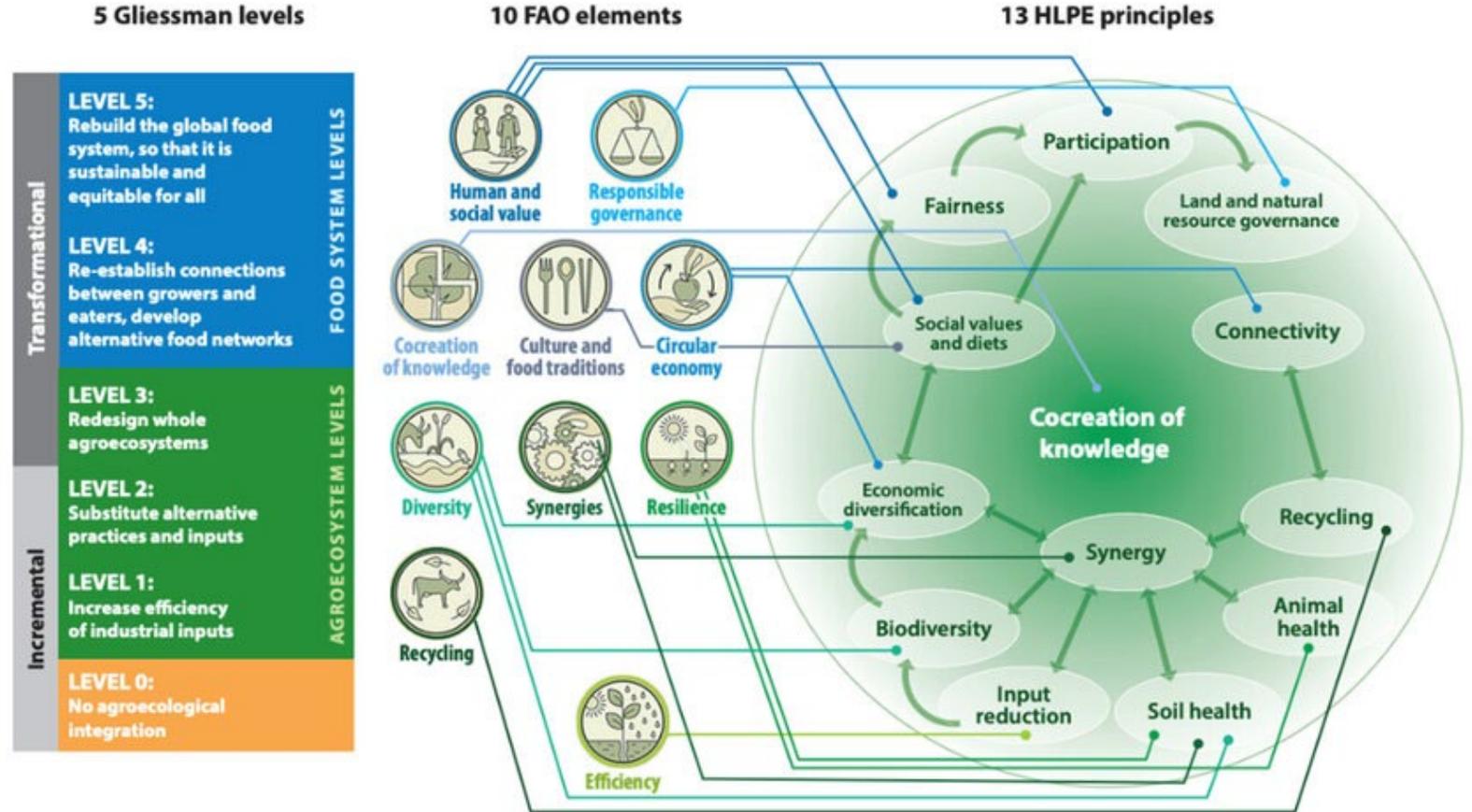


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# Agroecology: a quick reccap

holistic and integrated approach applies **ecological & social concepts** and principles to design **sustainable agriculture and food systems** optimization of **interactions** between plants, animals, humans (social) and the environment



FAO Agroecology Knowledge Hub, Gliessmann 2016



# How to measure agroecological transformation?

- Tool for Agroecology Performance Evaluation (TAPE) – Mandate to FAO from Member countries
- Multi-dimensional framework (Step 0 -> Step 3)

## STEP 3

The final step of TAPE is a participatory analysis of the results, where the multidimensional performances (STEP 2) are reviewed in the light of the level of transition to agroecology (STEP 1) and the context and enabling environment (STEP 0). The analysis of the evidence generated in a systemic and multi-dimensional framework will inform the identification of the way forward with the community/territory and will generate a global database of harmonized evidence on the performance of agroecology. At this stage, any further methodology of assessment or indicator can be added to complement TAPE and provide deeper analyses on specific topics.



**Assessing Transitions to Sustainable Agriculture**  
Rosa F. Scherf<sup>1</sup>, Beznér Kerr<sup>2</sup>, and ...

There is increasing interest in agroecology as a way to move toward more sustainable agriculture and food systems. However, the evidence of agroecology's contribution to sustainability remains fragmented because of heterogeneous methods and data. This study aims to address this challenge by developing a framework for the development of the Tool for Agroecology Performance Evaluation (TAPE), to produce and consolidate evidence on the multidimensional performances of agroecological systems. TAPE is a multi-dimensional framework that includes a description of the main socio-economic and demographic characteristics of the agricultural and food systems and an analysis of the enabling environment in terms of relevant policy, technology, social, and institutional factors. The Characterization of Agroecological Transitions (CAT) is a multi-dimensional framework adopted by FAO and its member countries, using descriptive scales to establish scores and assessing the degree of transition with information from the farm/household and community levels. The Characterization of Agroecological Transitions (CAT) is a multi-dimensional framework adopted by FAO and its member countries, using descriptive scales to establish scores and assessing the degree of transition with information from the farm/household and community levels. The Characterization of Agroecological Transitions (CAT) is a multi-dimensional framework adopted by FAO and its member countries, using descriptive scales to establish scores and assessing the degree of transition with information from the farm/household and community levels.

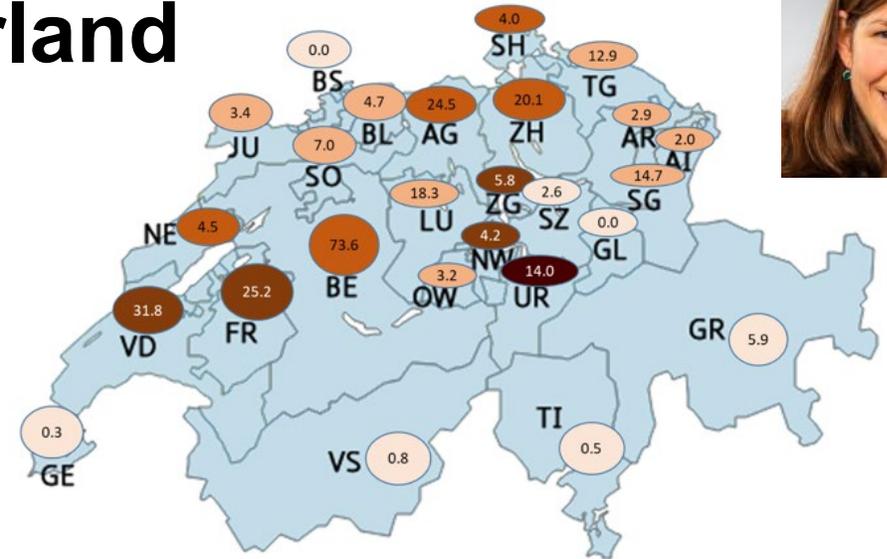
→ Monitor and track the agroecological status / transition of a system in a harmonized way



# TAPE application in Switzerland



- Swiss agri-environmental data network (SAEDN)
- (> 300 farms, since 2009)
- calculation of several agri-environmental indicators based on real farm management data
- one of the indicators is biodiversity («unplanned»)



## Goal:

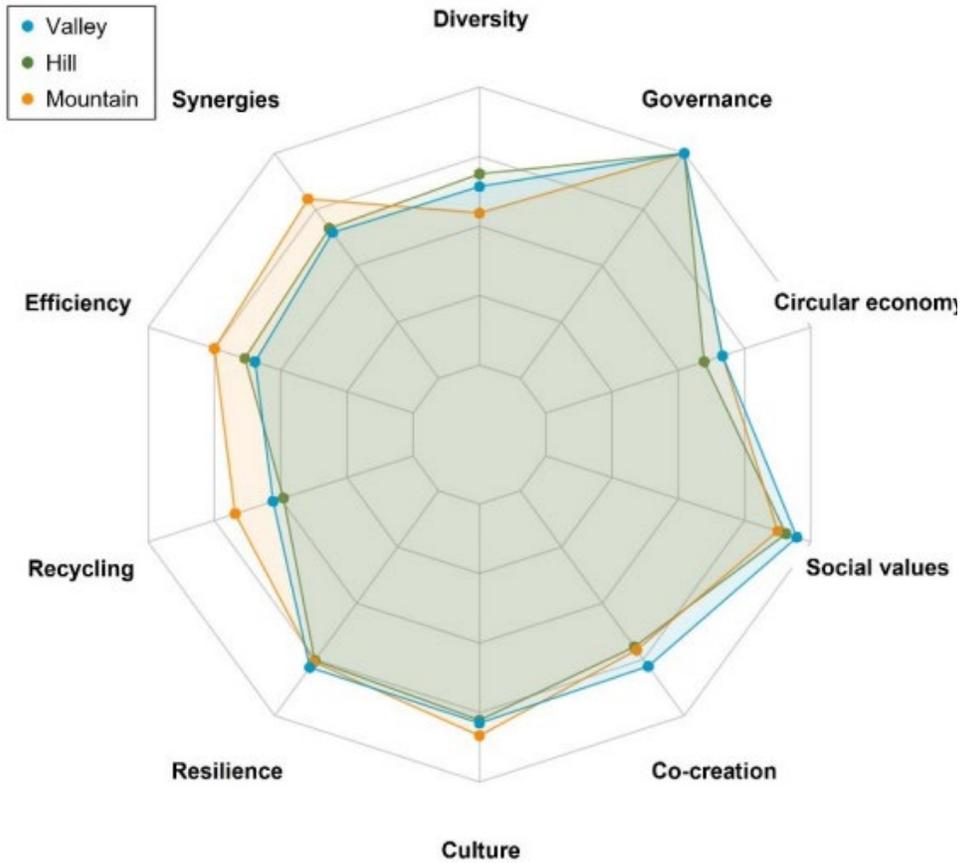
- Test TAPE – predominantly used in low-and-middle income countries (LMIC) – and adapt it for the Swiss (high-income) context



Gilgen et al. 2022, Agricultural Systems



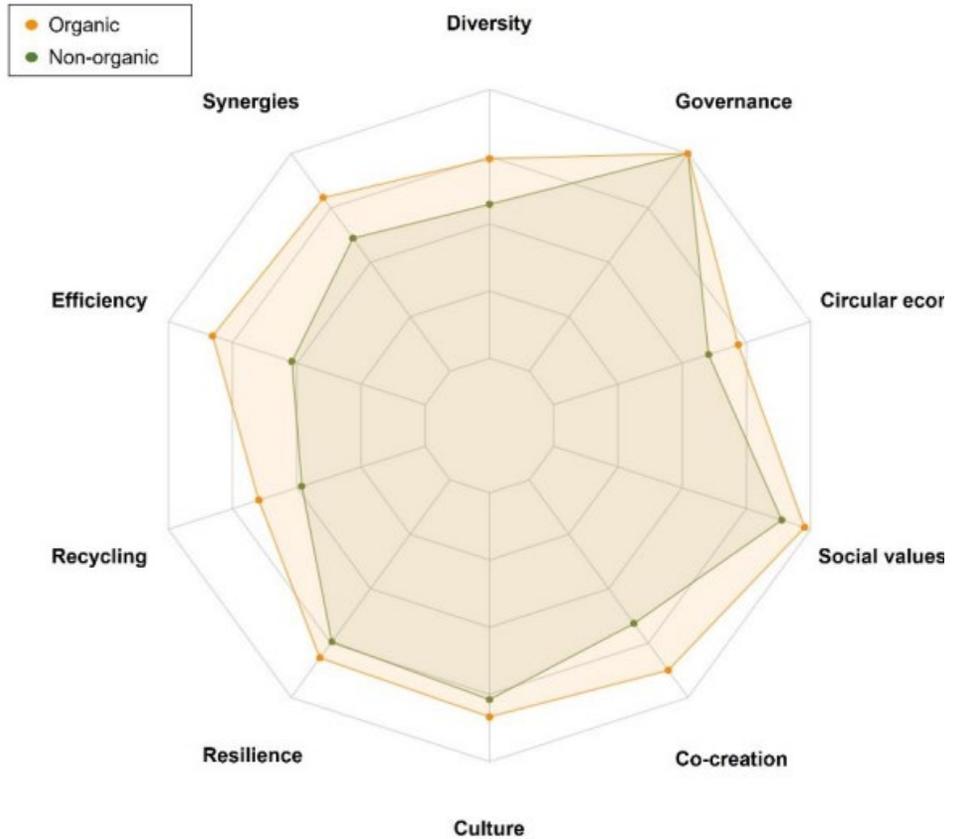
# TAPE results for Swiss farms: land classification



Step 1



# TAPE results for Swiss farms: farm type



## Step 1



# Lessons learned for TAPE in Switzerland

- representativity at land classification/farm type
- representativity of farm typologies currently restricted to major crop cultures and not always to the special cultures (wine, fruit orchards etc.) – adjustment needed
- time aspect needs to be kept in mind due to complexity of farms in high-income countries
- can easily be supplemented with existing data sources – ie economic indicators
- compensation payment for farmers and feedback to the farmers is essential
- food systems also includes consumers → **new project (8 years, 3 densely populated areas, each farm is accompanied by 5 consumers, direct marketing...)**

# TAPE assessment at national level

## Goal:

**Agroecological status of the Swiss Agricultural and Food System** (national scale) following the 10 elements of agroecology (TAPE step 1) and the 10 core criteria of performance (step 2) **based on readily available data** (ie national statistics etc.).



Bender et al. in prep.



# Step 1: Data availability

- ++ detailed info available and accessible
- + partly available and accessible
- only national value
- ? unsure if data available.

|            | TAPE indicator  | availability | Data source   | Comments   | Confidence |
|------------|---|--------------|---|--|------------|
| DIVERSITY  | Crops   | ++           | MAUS- AGIS  |  | Green      |
|            | Animals (including fish and insects)  | +            | MAUS- AGIS  | data on fish and insects unsure  | Green      |
|            | Trees (and other perennials)  | -            | MAUS- Cantonal area utilization data                  | Data on fruit trees available, other trees partly available (depending on canton) potential to use remote sensing? | Yellow     |
|            | Diversity of activities, products and services                                | +            | Book keeping/ operational management data             |  | Yellow     |
| SYNERGIES  | Crop-livestock-aquaculture integration  | +            | Book keeping/ operational management data, MAUS- AGIS | aquaculture only on level canton available   | Yellow     |
|            | Soil-plants system management   | ++           | MAUS- AGIS  |  | Green      |
|            | Integration with trees (agroforestry, silvopastoralism, agrosilvopastoralism) | ?            |   |  | Orange     |
|            | Connectivity between elements of the agroecosystem and the landscape          | ?            | MAUS- Cantonal area utilization data                  | remote sensing potential?  | Orange     |
| EFFICIENCY | Use of external inputs  | ++           | MAUS- HoDuFlu   |  | Green      |
|            | Management of soil fertility  | ++           | MAUS  |  | Green      |
|            | Management of pests & diseases  | ++           | MAUS  |  | Green      |
|            | Productivity and household's needs  | ++           | Book keeping/ operational management data             |  | Green      |
| RECYCLING  | Recycling of biomass and nutrients  | +            | MAUS- HoDuFlu   |  | Green      |
|            | Water saving  | ?            | Agricultural census                                   | only data on irrigation available  | Orange     |
|            | Management of seeds and breeds  | +            | Book keeping  | Info partly available, unsure  | Yellow     |
|            | Renewable energy and production   | -            | Federal office for energy                             | only national data   | Yellow     |
| RESILIENCE | Stability of income/production and capacity to recover from perturbations     | ++           | Book keeping/ operational management data             |  | Green      |
|            | Mechanisms to reduce vulnerability  | +            | Book keeping/ operational management data             |  | Yellow     |
|            | Environmental resilience and capacity to adapt to climate change              | ?            |   | unsure if data available   | Orange     |
|            | Diversity   | +            | MAUS  |  | Green      |

- Environmental and economic dimensions are fairly well covered
- Social, cultural and nutrition dimensions are less well represented -> educated «guess»

Bender et al. in prep.



# Step 1: Data availability

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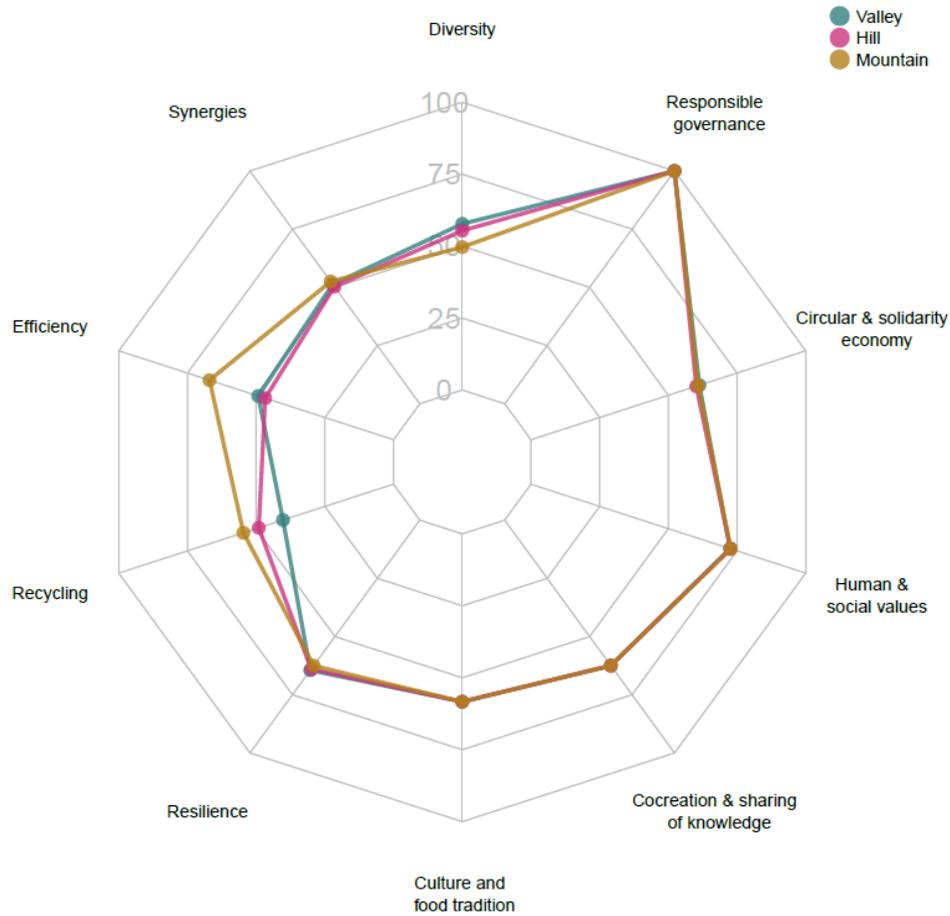
|                                    | TAPE indicator  | availability | Data source  | Comments   | Confidence |
|------------------------------------|---|--------------|--|--|------------|
| CULTURE & FOOD TRADITION           | Appropriate diet and nutrition awareness  | -            | MenuCH   | Small sample at national scale available   |            |
|                                    | Local or traditional (peasant / indigenous) identity and awareness                                  | ?            | MenuCH ?   |  |            |
|                                    | Use of local varieties/breeds and traditional (peasant & indigenous) knowledge for food preparation | ?            |  |  |            |
| CO-CREATION & SHARING OF KNOWLEDGE | Platforms for the horizontal creation and transfer of knowledge and good practices                  | ?            |  |  |            |
|                                    | Access to agroecological knowledge and interest of producers in agroecology                         | ?            |  |  |            |
|                                    | Participation of producers in networks and grassroot organizations                                  | ?            |  |  |            |
| HUMAN & SOCIAL VALUES              | Women's empowerment   | +            | Agricultural census                                    | data on social security accounts of women , data on women managing farm operations |            |
|                                    | Labour (productive conditions, social inequalities)   | ++           | SAKE   |  |            |
|                                    | Youth empowerment and emigration  | ++           | SAKE   |  |            |
|                                    | Animal welfare [if applicable]  | ++           | MAUS   |  |            |
| CIRCULAR & SOLIDARITY ECONOMY      | Products and services marketed locally  | +            | Agricultural census                                    |  |            |
|                                    | Networks of producers, relationship with consumers and presence of intermediaries                   | +            | Agricultural census                                    |  |            |
|                                    | Local food system   | +            | Agricultural census                                    |  |            |
| RESPONSIBLE GOVERNANCE             | Producers empowerment   | ++           | Comprehensive Swiss Government regulations implemented | All farms get full score   |            |
|                                    | Producers' organizations and associations   | ++           | Comprehensive Swiss Government regulations implemented | All farms get full score   |            |
|                                    | Participation of producers in governance of land and natural resources                              | ++           | Comprehensive Swiss Government regulations implemented |  |            |

- Solutions and opportunities for investment to fill knowledge gaps

Bender et al. in prep.



# TAPE national results: Step 1



Seperated by land classification



# TAPE national allows for SDG tracking



Indicator 2.4.1 - Proportion of agricultural area under productive and sustainable agriculture

The area under productive and sustainable agriculture captures the three dimensions of sustainable production: environmental, economic and social.

The measurement instrument - farm surveys - will give countries the flexibility to identify priorities and challenges within the three dimensions of sustainability. Land under productive and sustainable agriculture will be those farms and associated agricultural land area that satisfy the sustainability criteria of the sub-indicators selected across all three dimensions. This indicator will measure progress towards SDG Target 2.4.





# How to make TAPE better: biodiversity?

## Goal:

Advance the TAPE biodiversity indicator beyond planned agrobiodiversity



Food and Agriculture  
Organization of the  
United Nations

Gilgen et al. 2023, Merbold et al. in prep.

# The «Swiss» agricultural biodiversity indicator

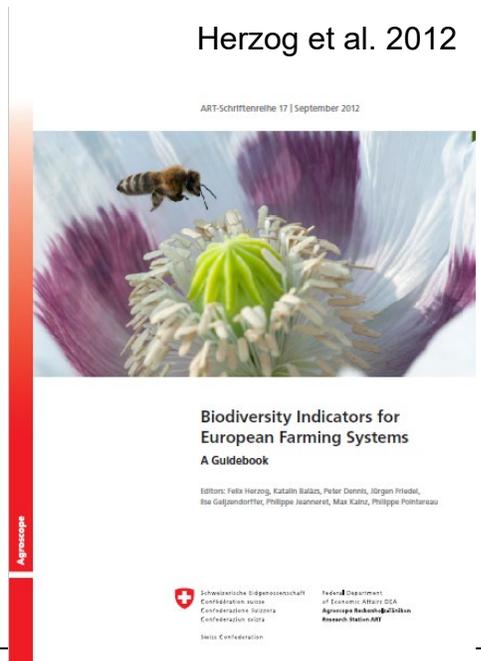
Starting point: high-quality biodiversity indicator based on complex Swiss Agricultural Life Cycle Assessment (SALCA-BD) Jeanneret et al. 2008

- Semi quantitative (relative) point system (the higher, the better)
- background >1000 scientific publications
- mainly Swiss/Central European focus

→ not feasible for TAPE... What is the next best?

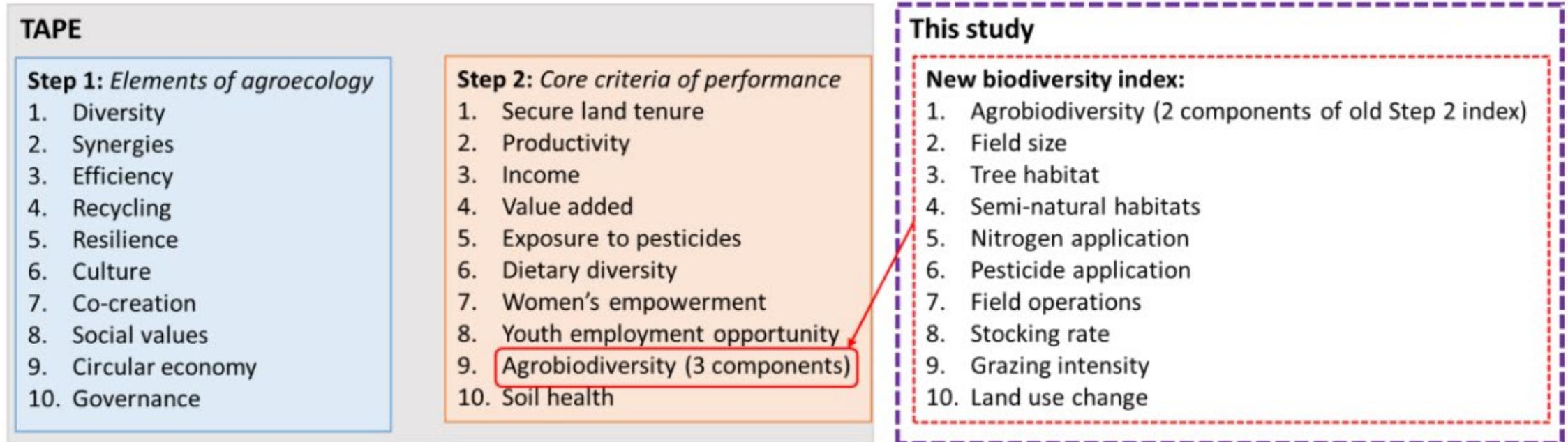
→ proxies that drive biodiversity

→ keep it as simple as possible





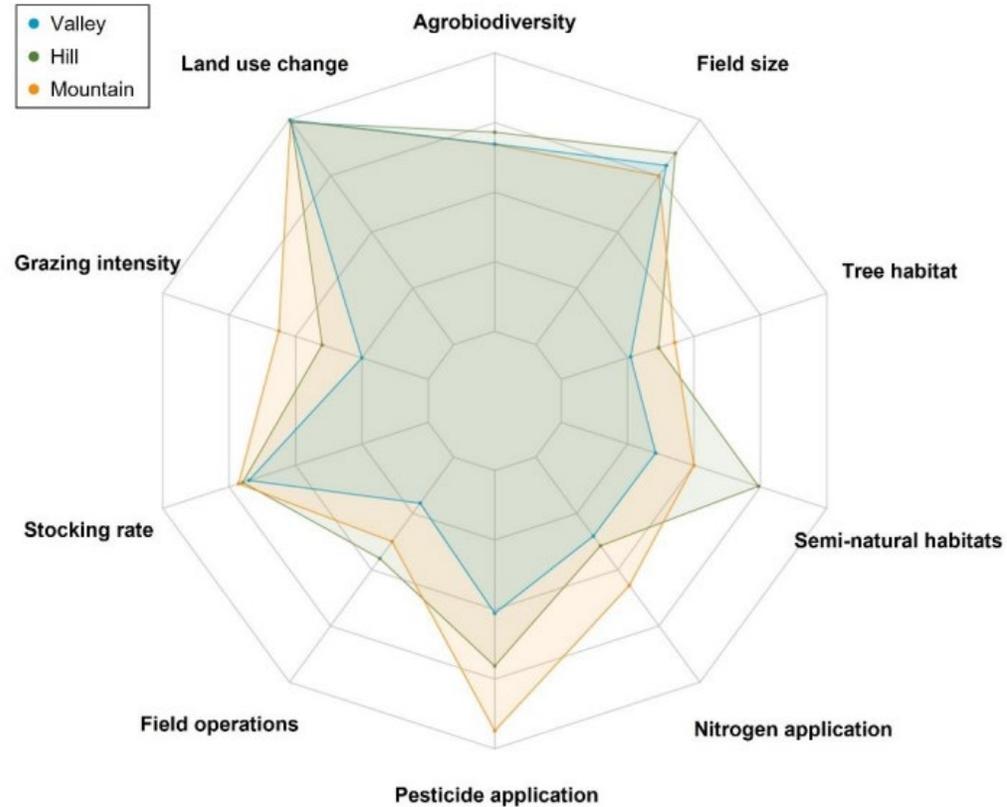
# New biodiversity index: What is it about?



Test it within the Swiss Agri-environmental network and also in a low-and-middle income country (Kenya)



# TAPE: advanced biodiversity indicator (CH)

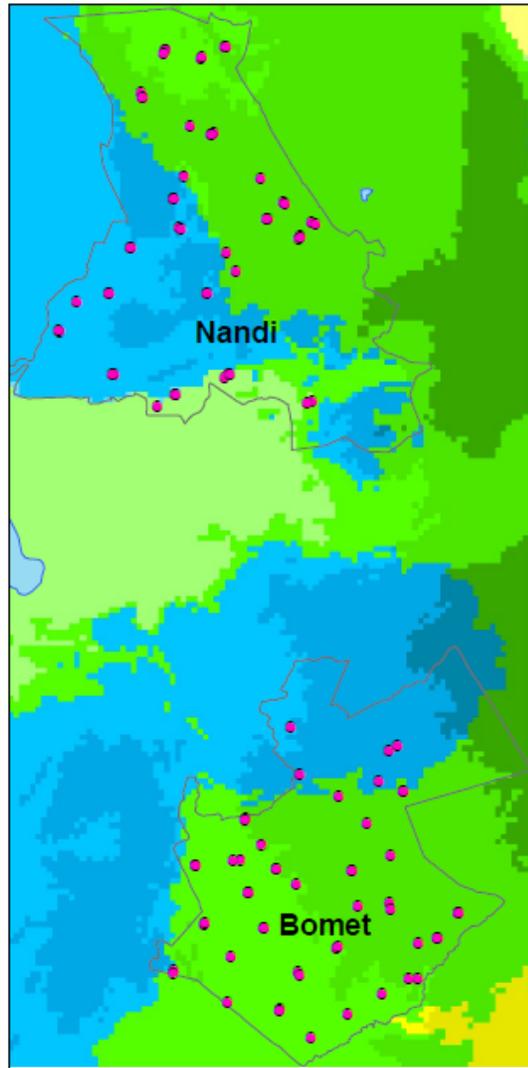
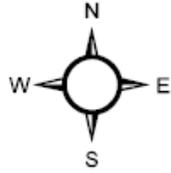


Separated by land classification



# Pilot in Kenya

2 regions  
(Nandi & Bomet county)

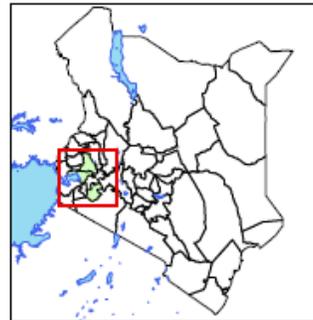


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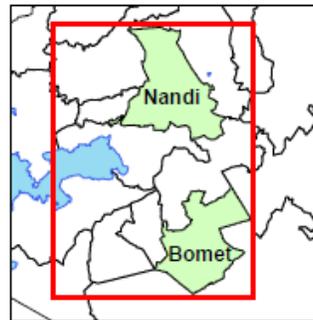
0 10 20 30 Kilometers



Africa



Kenya



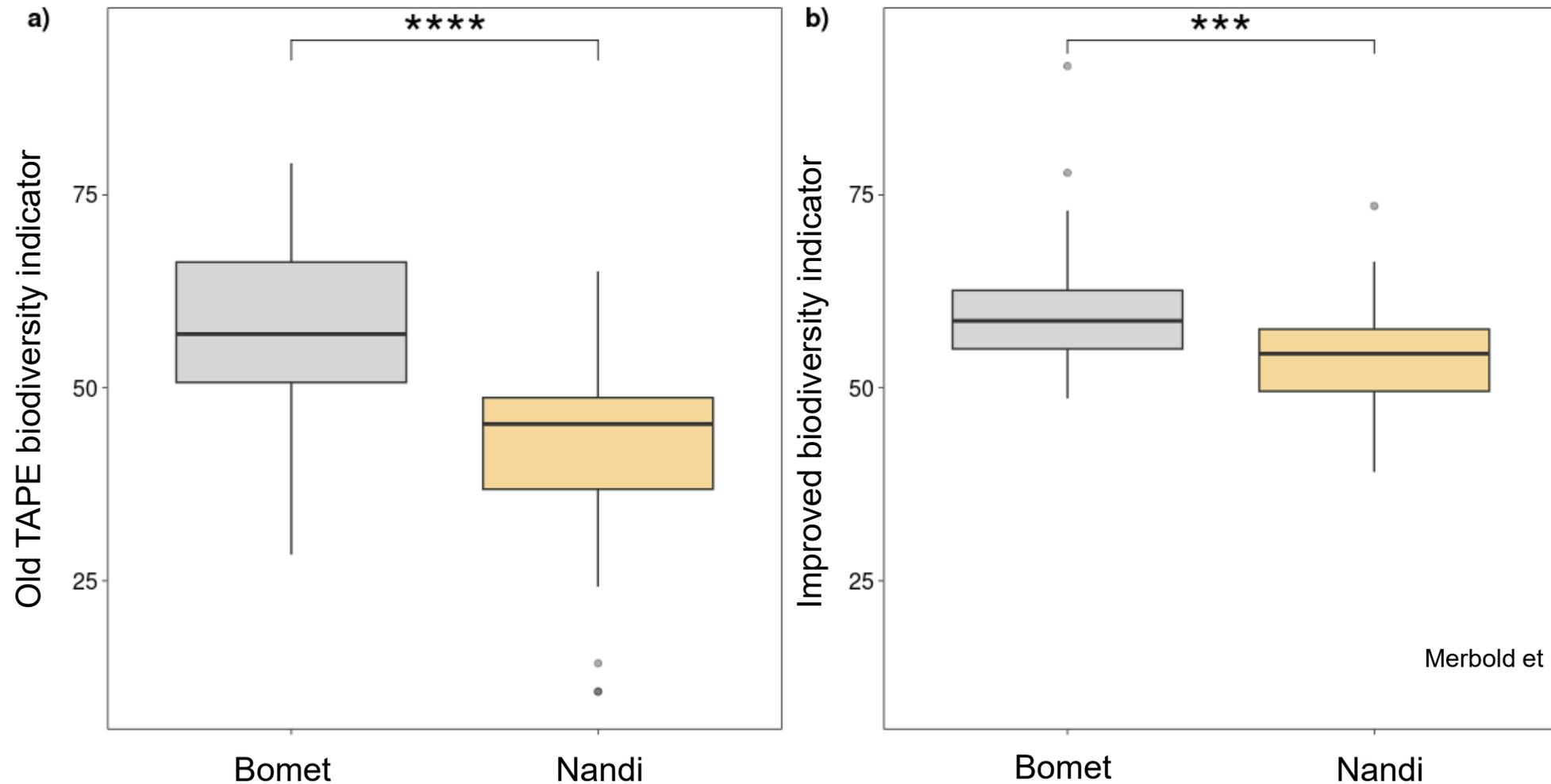
Counties





# Results from Kenya: biodiversity

- Comparison between the **old** and the **new** biodiversity indicator for the two counties



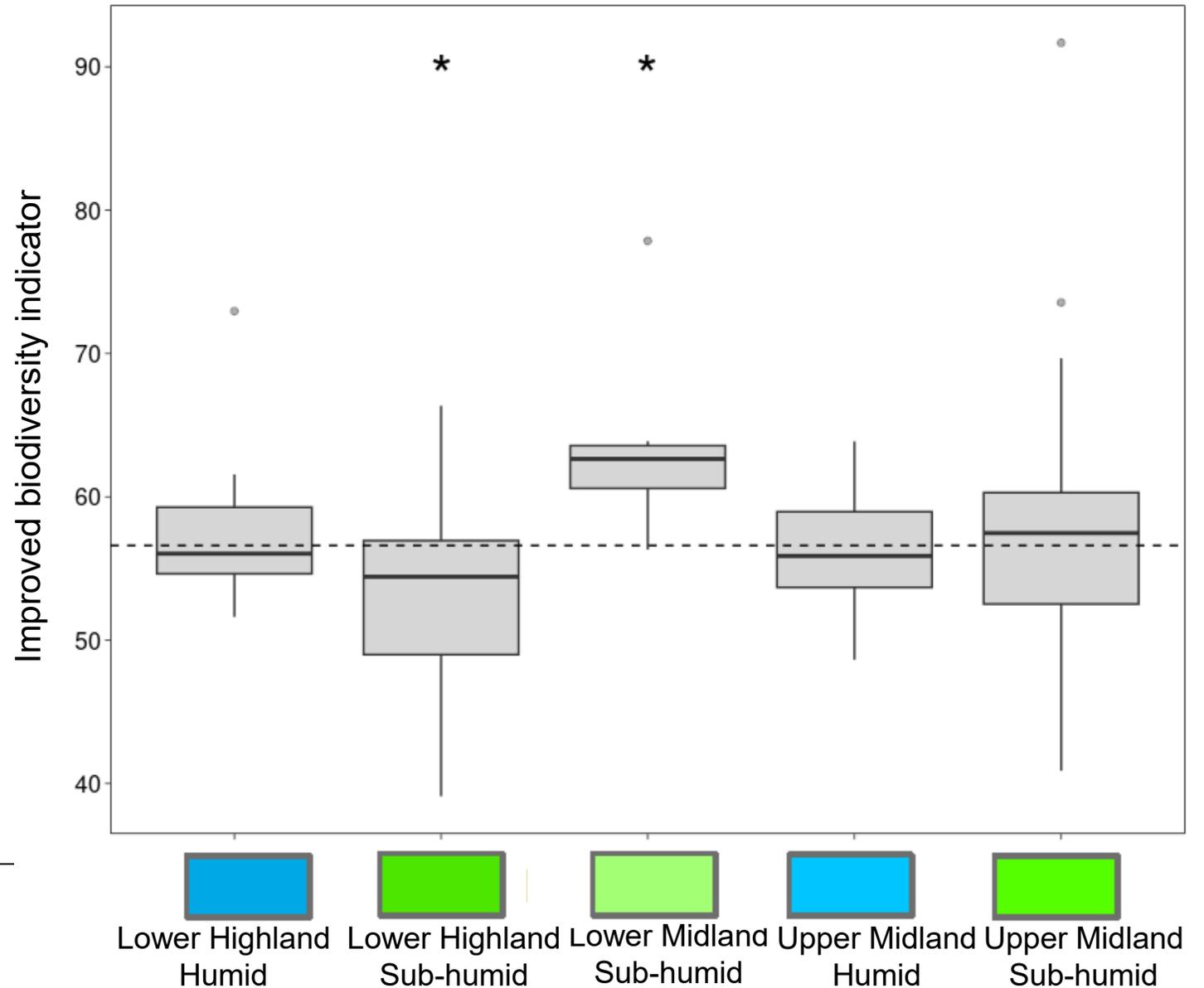
Merbold et al. in prep.



# Results from Kenya: biodiversity

New biodiversity indicator across the different agroecological zones

**agroecological zones (AEZ)** are not a key driver of biodiversity





# How to make TAPE better: climate

## Goal:

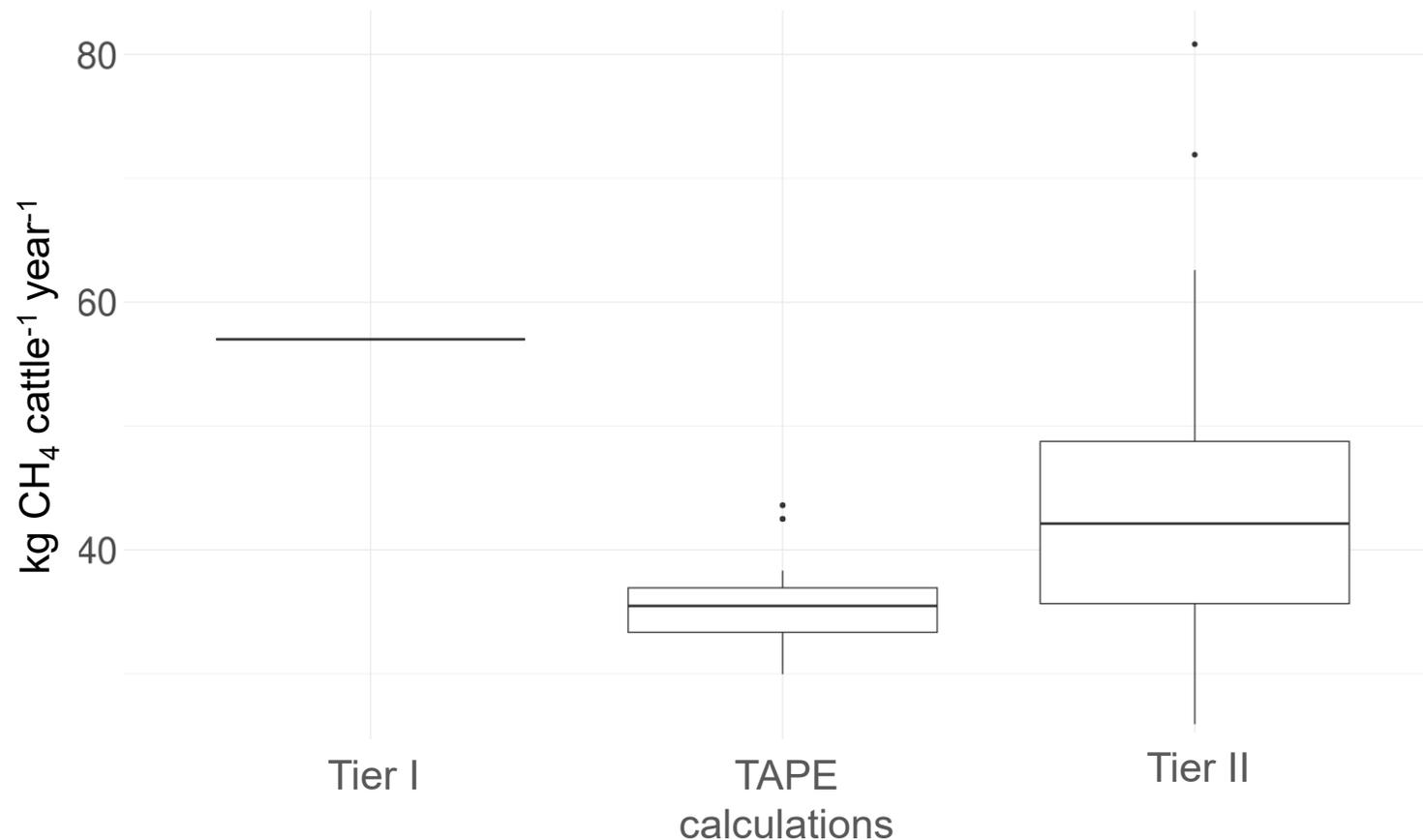
Develop a “climate score” for TAPE to allow for GHG mitigation tracking



Paunovic et al. in prep.



# TAPE: Climate Score Performance



TAPE climate score data are considerably “better” than TIER 1 and TIER 2 estimates (IPCC guidelines)

Works for cattle, small ruminants and manure management systems

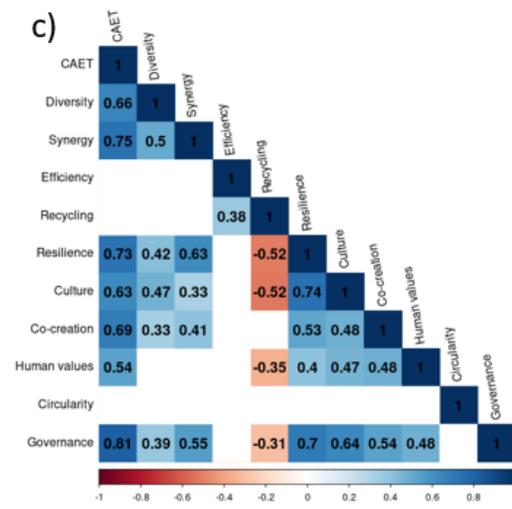
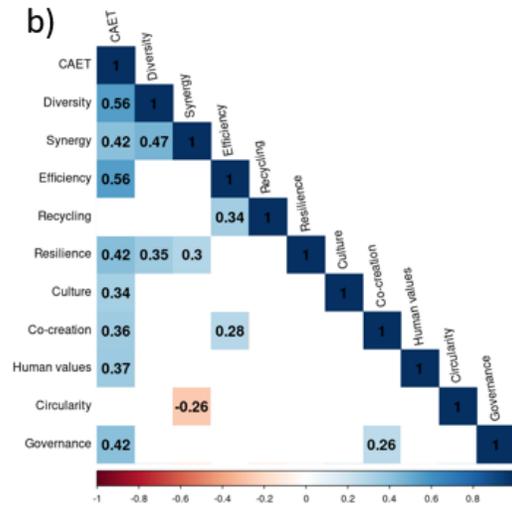
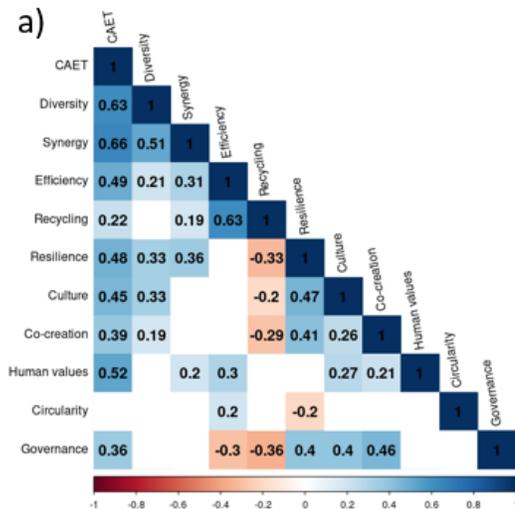
Manure management question needs to be added to TAPE

Paunovic et al. in prep.



# Take Home Message

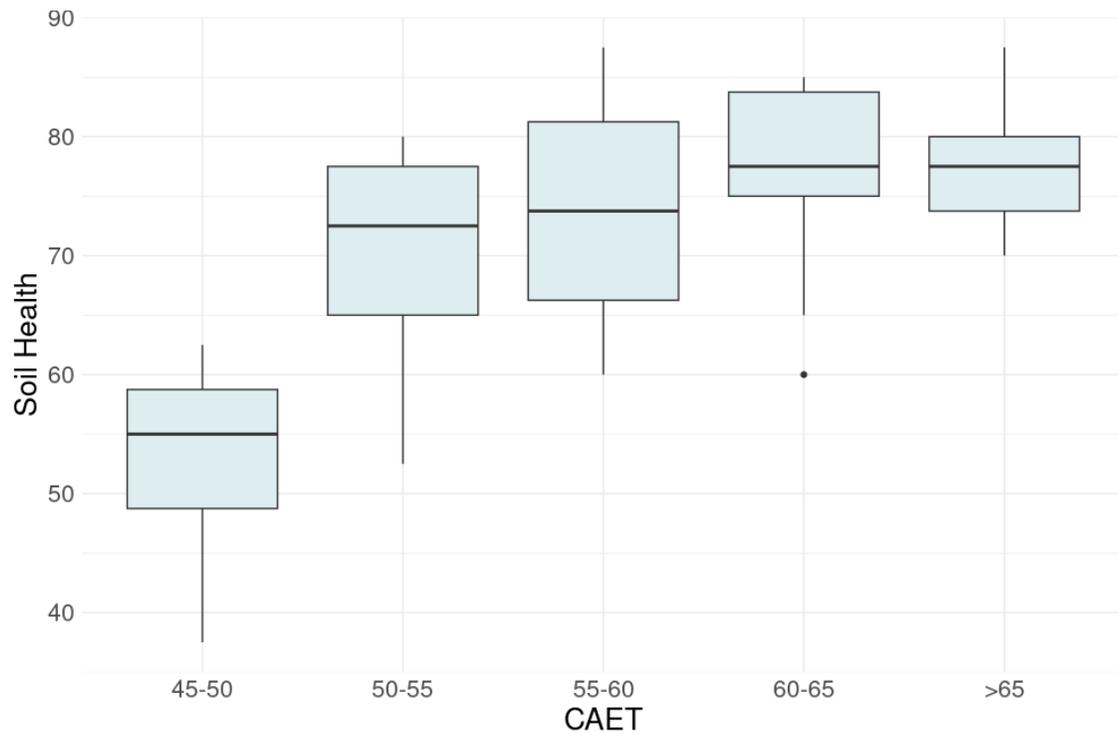
- TAPE is a powerful standardized tool that allows for agroecological assessments of farm systems as well as the agri-food system
- Additional developments / supplementation with existing indicators is possible
- Provides and opportunity for identifying feasible modifications to achieve more resilient and sustainable agricultural/livestock systems



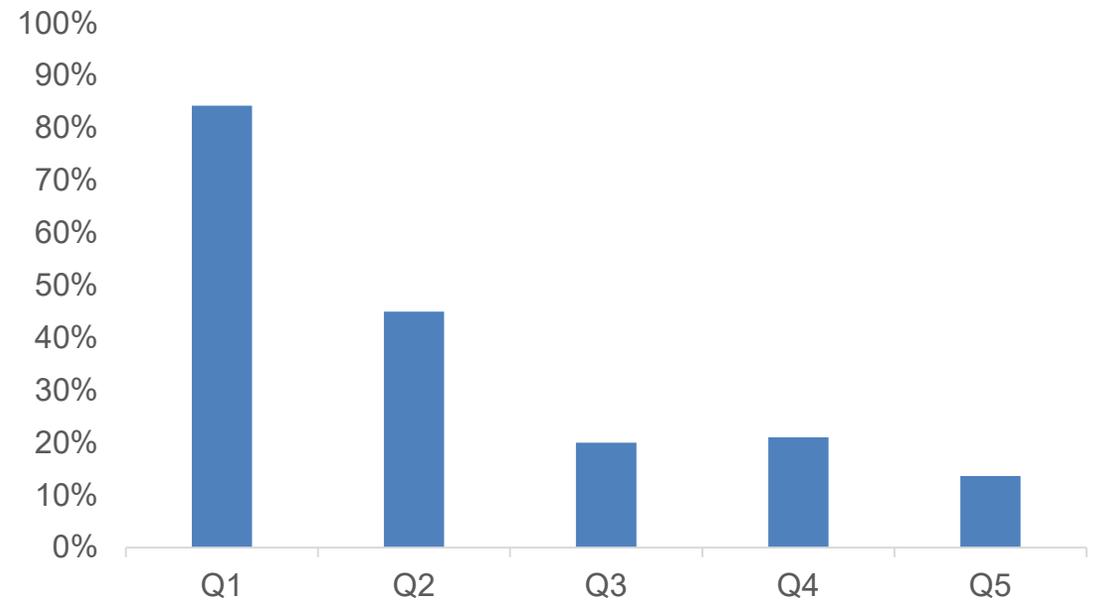
Merbold et al. in prep.



# Analyse Step 1 and Step 2 interactions



Consumption of **dairy products** per CAET quintile. The quintiles 1 to 5 represent the highest to the lowest CAET scores.



**Soil health** vs quintiles of CAET scores along both Nandi and Bomet county

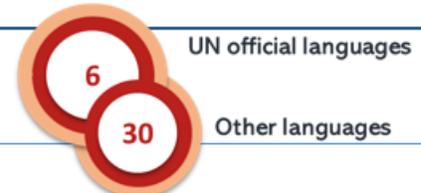
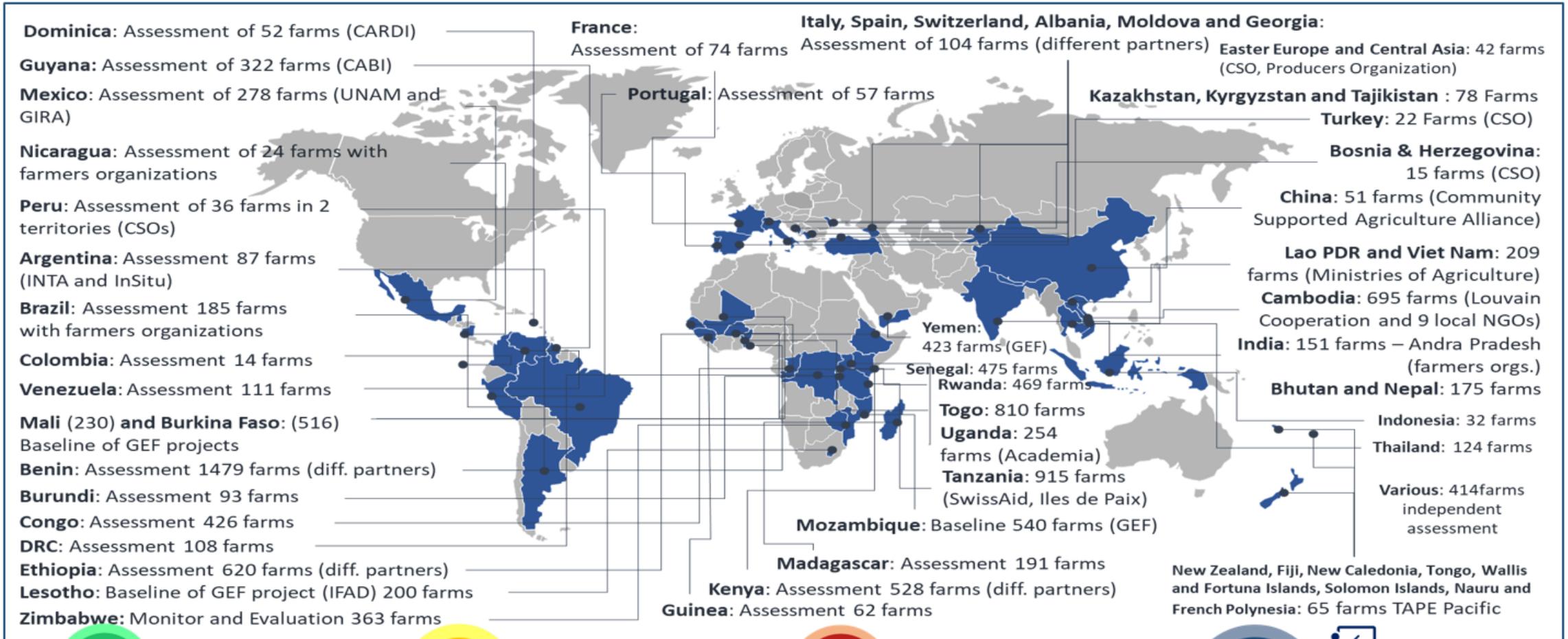
Merbold et al. in prep.



# TAPE is already used globally

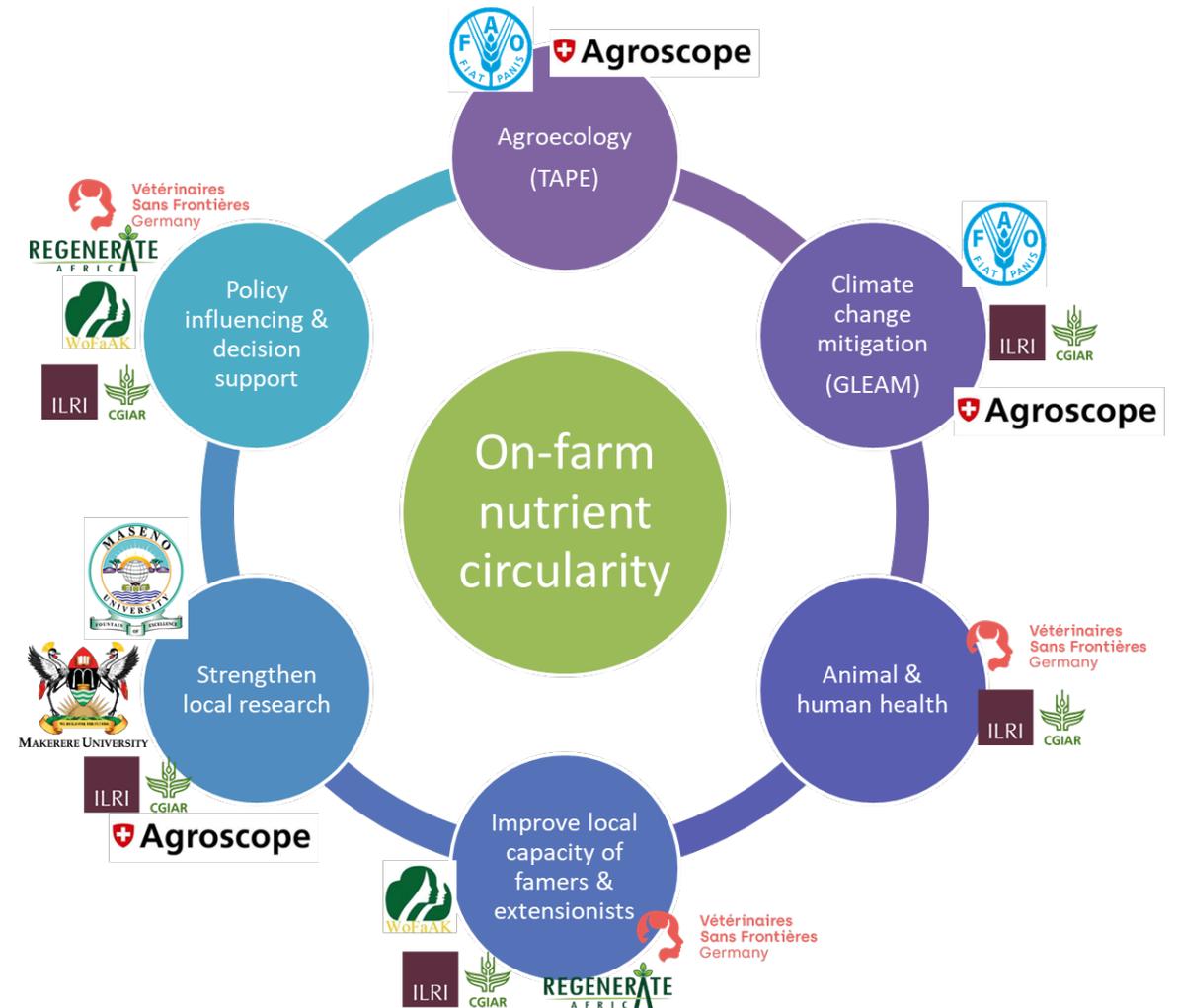


Food and Agriculture  
Organization of the  
United Nations



# 🇨🇭 Whats next?

**CIRcularity of Nutrients in Agroecosystems and co-benefits on animal and human health (CIRNA) funded by SNF & SDC**





**Thank you for your attention**

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