

SIFS farms as multi-trophic biodiversity refugia across three agroclimatic zones of India

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Introduction

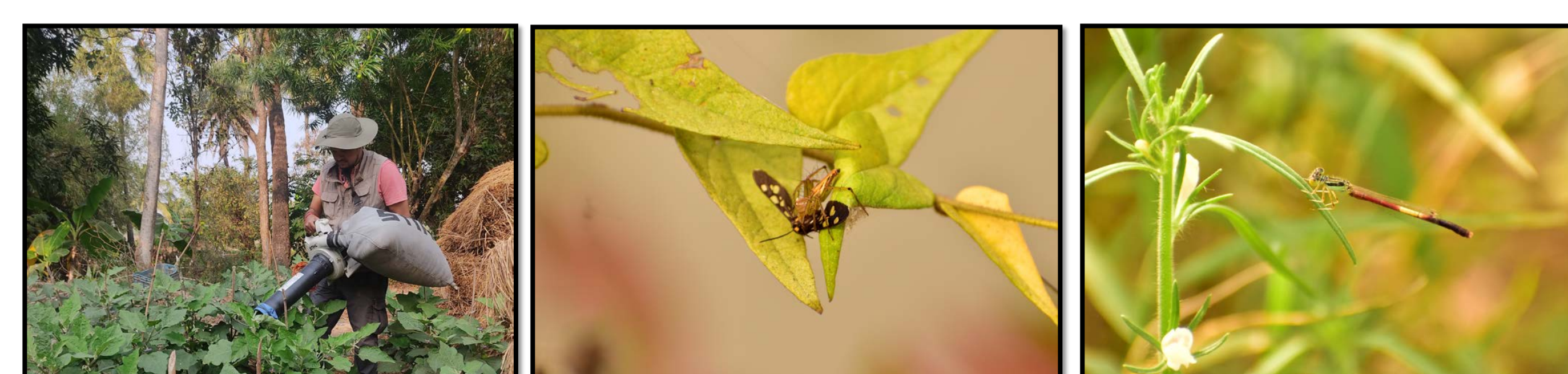
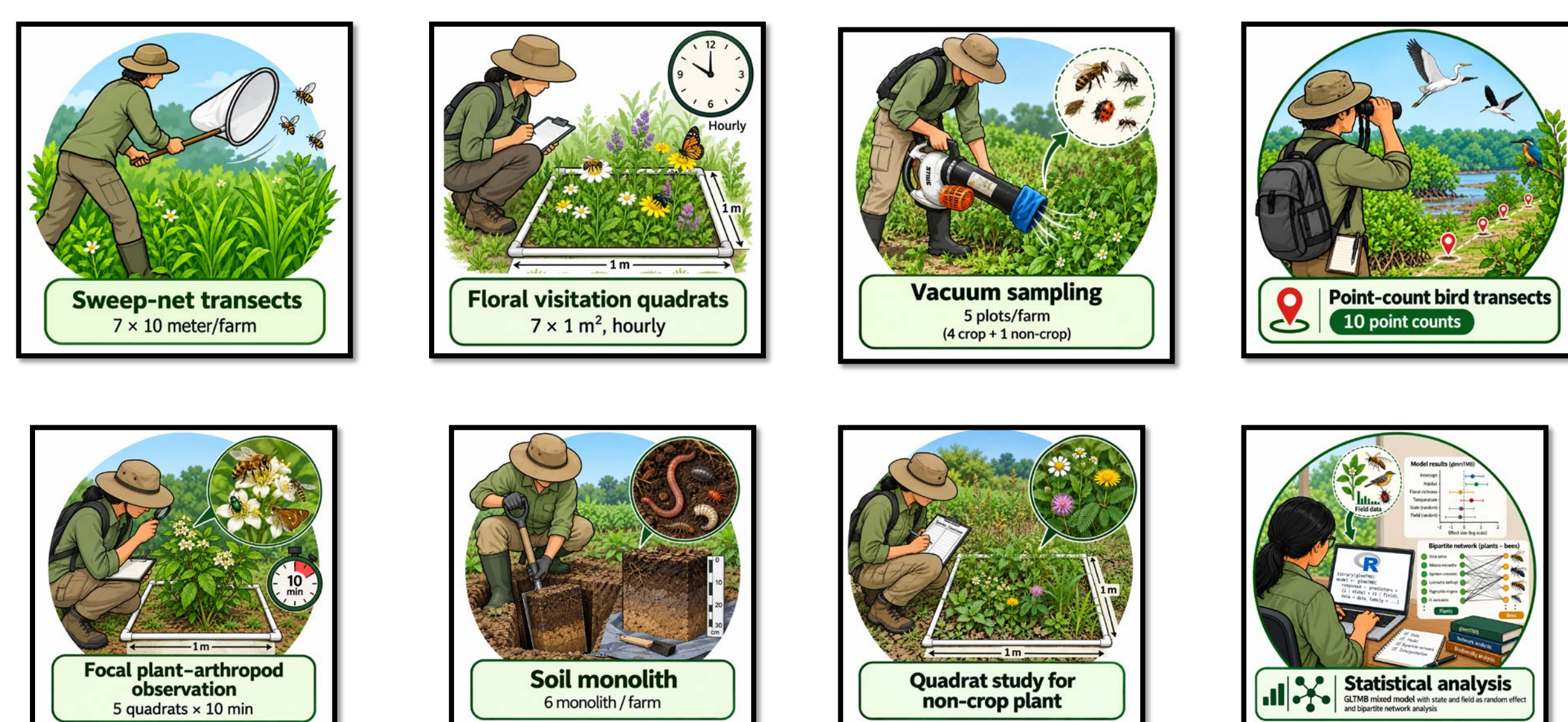
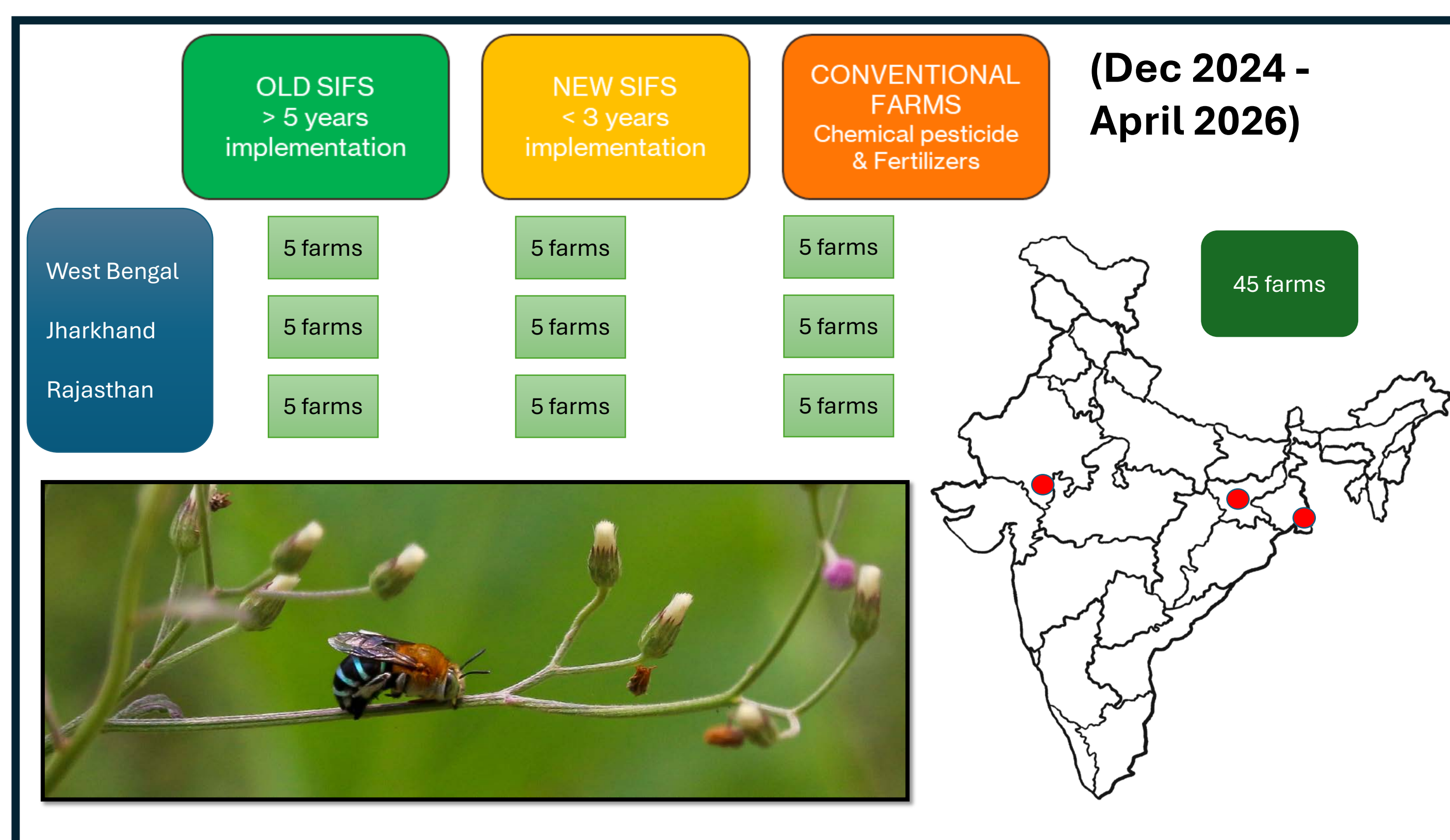
- High-input conventional farming drives biodiversity loss and cascading declines in ecosystem services
- Sustainable Integrated Farming Systems (SIFS) integrates crops, horticulture, agroforestry, livestock and aquaculture with minimal external inputs, promoted by Welthungerhilfe across India, Nepal and Bangladesh
- Adoption is growing, but multi-trophic evidence for SIFS as biodiversity refugia is lacking

Do SIFS farms act as multi-trophic biodiversity refugia, and how do plant–arthropod interaction networks vary across agroclimatic zones?



Pollinators · Arthropod natural enemies · Herbivores · Soil macrobiota · Non-crop plants · Birds
Compared across **Old SIFS** · **New SIFS** · **Conventional**, in three agroclimatic zones

Methods:



Results:

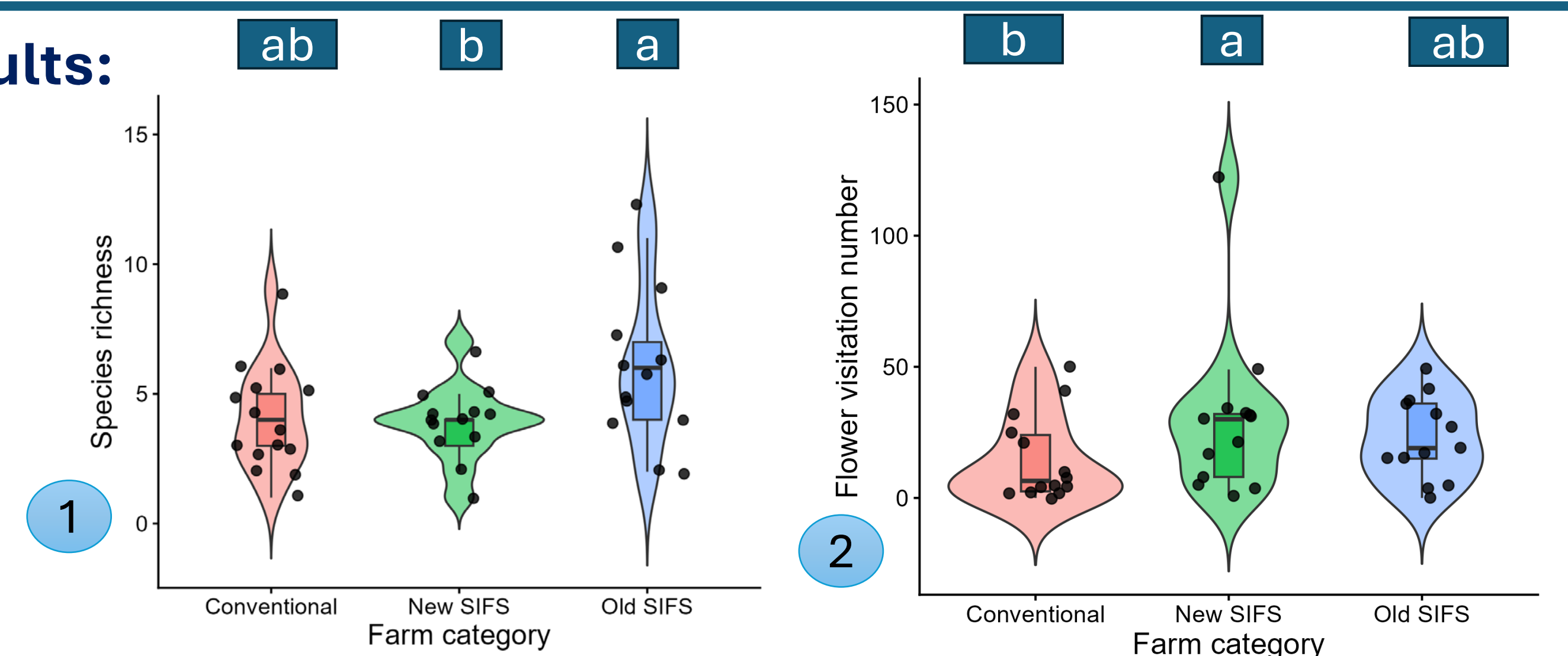


Fig. 1. Bee species richness and bee visitation by farm category (n = 41). Groups sharing a letter don't differ (GLMM, Tukey $p > 0.05$).

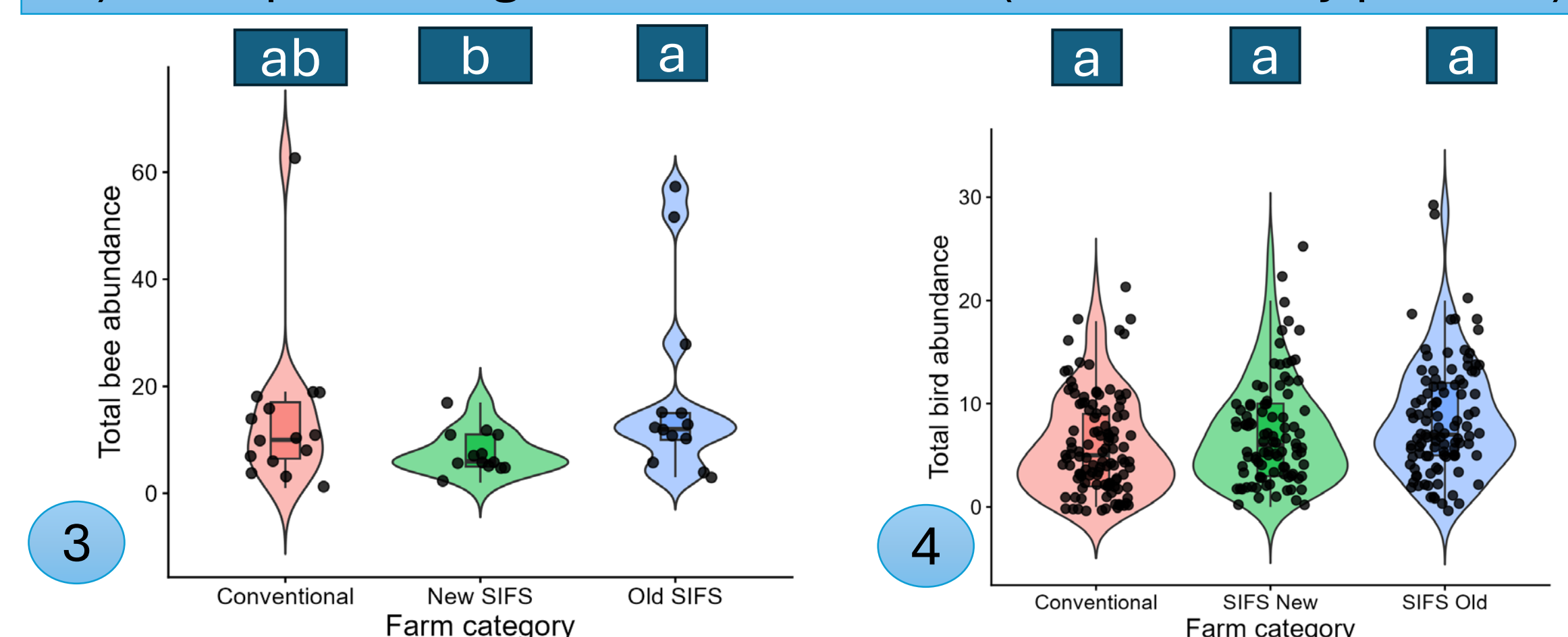


Fig. 2. Total bee abundance and bird abundance by farm category (n = 41). Groups sharing a letter don't differ (GLMM, Tukey $p > 0.05$).

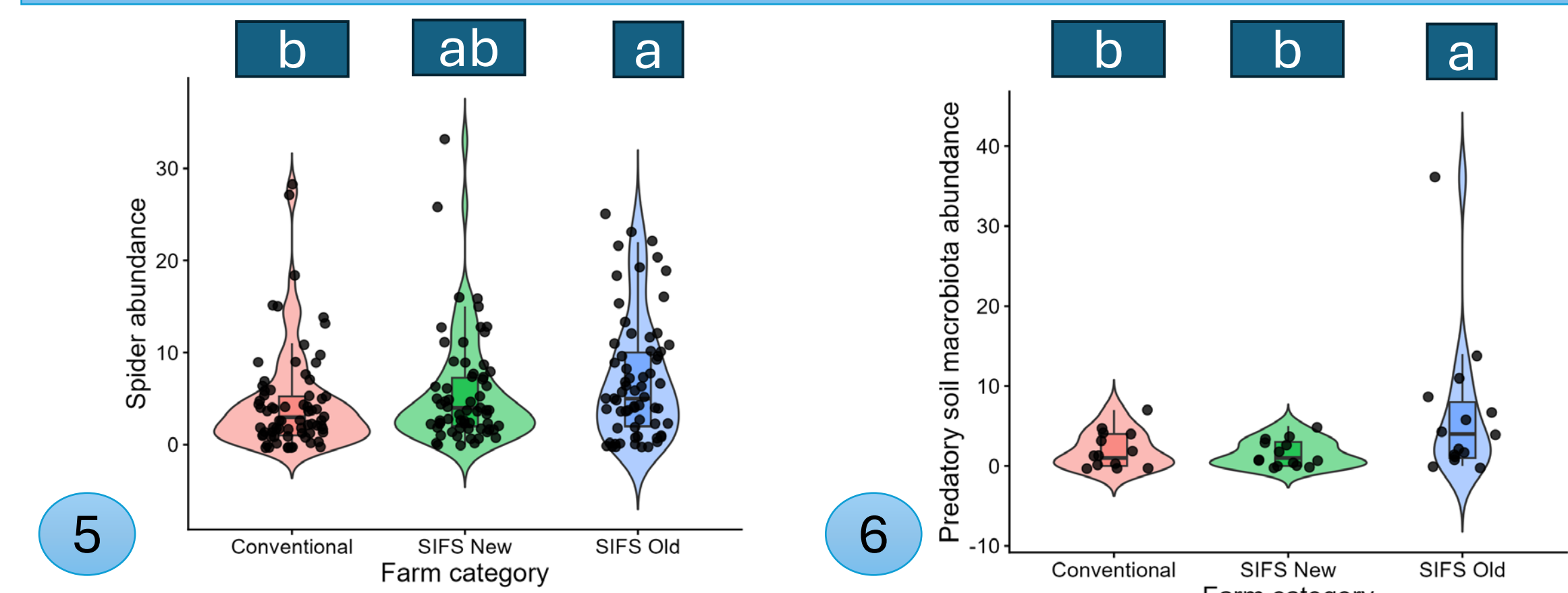
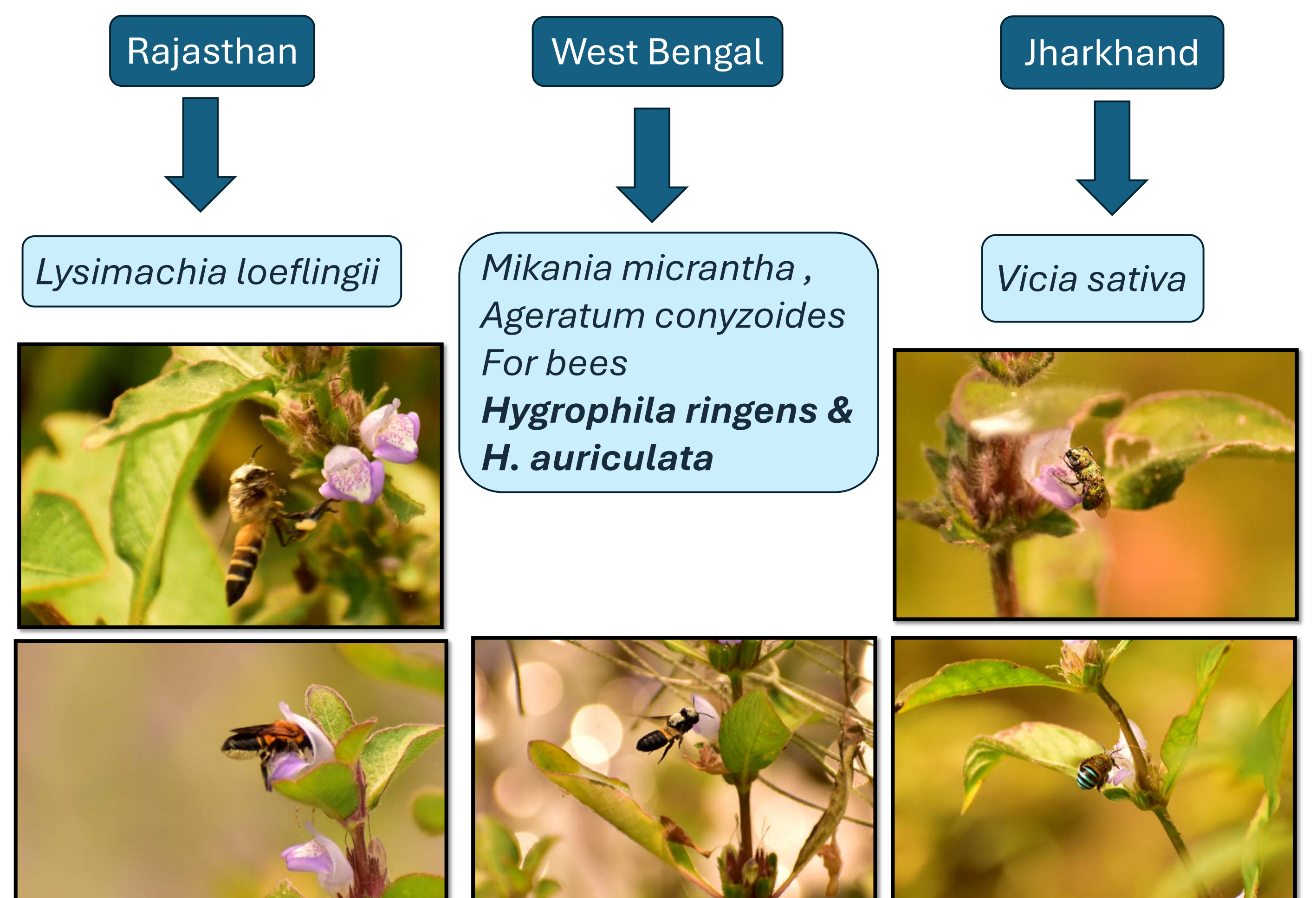


Fig. 3. Spider abundance and soil predator abundance by farm category (n = 45). Groups sharing a letter don't differ (GLMM, Tukey $p > 0.05$).

Key connector plants occupy distinct roles across networks



Conclusions:

- SIFS outperformed Conventional farming across most taxa studied: bees, spiders, soil arthropod predators and flower visitation all showed higher responses
- A small set of native non-crop plants anchor pollination networks. In West Bengal, *Hygrophila ringens* & *H. auriculata* are the prime candidate for conservation and restoration