The relationship between the diversity of herbaceous plants and the extent and heterogeneity of croplands, in noncrop vegetation in an agricultural landscape of south China

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Background
- Two opposing viewpoints to balance biodiversity and agriculture:
  - Land sparing: But difficult in highly populated areas
  - Land sharing:
    - Environmentally friendly farm practices (e.g. organic farming)
    - Retain natural fragments, fencerows or even old trees
    - Many small crop fields of different types of crops
- Heterogeneity defined:
  - # of cover types
  - Spatial arrangement of those
- Gap in knowledge:
  - Most research in temperate areas, developed countries (where biodiversity is lower)
  - Small-scaled farming has been seldom researched

Objectives
- Look at response variables of:
  - Shannon-Wiener diversity of herbaceous plants
  - % invasive species
  - % animal dispersed species
- See to what extent these response variables are explained by landscape variables:
  - Crop cover in 100 m scale
  - Crop cover in 500 m scale
  - Crop heterogeneity in 100 m scale
  - Field margin length
- Analyzed all species, and also native species and animal-dispersed species.

Hypotheses
- Greater crop coverage → Lower plant diversity
  - Less room for natural species
  - Higher non-native species
  - More industrial-scale techniques
  - Lower animal-dispersed species
  - More disturbance
- Greater field margins
  - More space for natural species
  - Lower non-native species
  - Higher animal-dispersed species
  - Configurational crop heterogeneity
- Greater crop heterogeneity
  - Higher plant diversity
  - Different weed species inside cropfields
  - Different conditions next to crops

Results
- The variation in the explanatory variables during the two years of the survey (2016–2017).
  - Crop Cover 100 m: Negatively affect plant diversity
  - Crop Cover 500 m: Positively affect plant diversity
  - Crop Compositional Heterogeneity: Not significant
  - Field Margin: Not significant for all species, but significant for animal-dispersed and native species.

Discussion
- Crop cover:
  - Non-crop areas can be refugia for herbaceous species
  - The effect of crop area changes at different scales, but strongest for local scale (negative relationship)
- Field margin and crop configurational heterogeneity:
  - Field margins can be refugia for herbaceous plants
  - Field margins are also a part of crop configurational heterogeneity (smaller fields have more margins), potentially affecting movement between crops by animals.
  - Field margin result found especially for animal-dispersed species.
- Crop compositional heterogeneity:
  - Studies on crop compositional heterogeneity on biodiversity have been inconsistent. We found no effect here, although a simultaneous study did find a positive effect on bird diversity.

Methods
- Agricultural area around Nanning city
- 72 sites (100m radius)

In 2016, 4 1x1m plots placed in available habitat, semi-randomly.
In 2017, 6 1x1m plots placed in available habitat, semi-randomly.
Try to sample 4 habitats (if present): border of major crop type (MAMA), border of minor crop type (MIMI), border between major and minor crops (MAMI), weed area (WEED).
All plants that are present in more than 10% of 100 10cm² grids are identified.

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