Indicator species for agrobiodiversity in rice paddy field: Research and its application to a new eco-labelling scheme in eastern rural Taiwan

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About HDARES
(Hualien District Agricultural Research and Extension Station)

- Crop improvement section
- Crop environment section
- Agricultural Extension section
- Lanyang Branch Station
Eco rice paddy field

- Paddy fields occupy around 150,000 hectares and cover about 19% of the arable land in rural Taiwan.
- Artificial wetland as freshwater habitats.
Ecosystem services & agricultural biodiversity matters

- Pest & Disease - Using diversity allows farmers to limit the spread of pests and diseases.
- Resilience - Managing climate risks with more crop options
- Nutrition & health - A diverse diet is the basis of food pyramids
- Sustainability - Diverse crops and land use sustains a variety of pollinators
- Traditional knowledge - passing on knowledge about local medicinal plants and traditional recipes

http://gaga.biodiv.tw/9701bx/in94.htm
• Organic farming can increase biodiversity in paddy fields and enhance pest prevention and control, pollination and soil development.
• Can we rely on some way to judge a farm’s biodiversity?
Figure 1. Location and sample sites of the case study area
principle component analysis (PCA) to demonstrate the main context

• Through the selection of predators, the findings showed that *Tetragnatha maxillosa* Thorell (1895), *Tetragnatha javana* Thorell (1890), and *Micrastis discolor* Fabricius (1798) was a positive linear relationship with the richness and abundances of invertebrates in paddy fields.

• They not only had higher frequency of occurrence in organic farm but also higher sensitivity to different farming practices.

• As indicator species to reflect artificial disturbance.

• The results also showed that the conventional farming practices could reduce habitat heterogeneity and cause negative effects on agro-biodiversity of rice paddy farmlands.
Figure. Three species used as agro-biodiversity indicators and species promoting environmentally friendly ecological farming.

*Tetragnatha maxillosa*

*Micraspis discolor*

*Tetragnatha javana*
Developing agro biodiversity indicator

**Tetragnatha maxillosa**

**Tetragnatha javana**

**Micraspis discolor**
Increasing Landscape diversity: Hedgerow management techniques for farmland (cooperate with Agribusiness company)
new eco-labelling scheme

• In order to apply the outcome of the research in a way that could benefit both local livelihood and biodiversity, HDARES worked together with:

  Tse-Xin Organic Agriculture Foundation
  Local farmers
  Yin-Chuan Organic private company
  Forestry Bureau

• The new eco-labelling scheme has attracted green consumers to purchase the relevant products and encouraged more farmers to participate in environmental friendly farming in eastern rural Taiwan.
Original Eco-Labelling Scheme
(Endangered species as indicators)

http://enw.e-info.org.tw/content/3634

Press conference

Figure. We extended the application scale of Green Conservation Label and cooperated with Tse-Xin Organic Agriculture Foundation, farmers, Rice Production and Marketing Group, Agribusiness Company and Forestry Bureau in this case.
What have we done?

Capacity building for farmers & New green labels for products

Developing agro biodiversity indicator species

- Reduce chemical input (pesticide & fertilizer)
  - Symbiotic Farming System
  - Biocontrol by bio-materials
  - Conserve nectar-rich flowering plants

Keep crop biodiversity

Food security & safety
The first international conference of Eco-agriculture and Satoyama Initiative, Taiwan (2015)
Challenges to mainstreaming the activities

• For persuade more farmers to do eco-friendly agriculture, the incentive is the key point.
• Elder farmers who lack for spontaneousness to do it as well as lack for variety stakeholders concerning about farmland management.
4-year project on strategic development and agricultural technique for enhancing ecosystem services for rural villages

Executive organization:

Department of Agricultural Technology, Department of International Cooperation, Department of Irrigation and Engineering, Hualien District Agricultural Research and Extension Station, Miaoli District Agricultural Research and Extension Station, National Taiwan University, National Donghwa University, Chinese Taipei Committee, International Commission on Irrigation and Drainage, Agricultural Engineering Research Center
A Framework for Collaborative Research on Integrated landscape management, 2017-2020

Institutional arrangement and collaborative management for enhancing community adaptive capacity (Social science)

Strategy 1
Enhancement & Community adaptive capacity

Strategy 2
Restoration & Landscape connectivity

Farmland diversity

Inter-/inner-species diversity

Strategy 3
Empowerment & Capacity building

Multi-stakeholder participation

Institutional analysis/arrangement

Analysis/evaluation

Empowerment

Knowledge/strategy

Strategy 4
Strategy 5
International cooperation/exchange

cooperation/contribution

Ecosystem/Landscape diversity

Species diversity

Institutional arrangement and collaborative management for enhancing community adaptive capacity (Natural science)
Recommendations

• It’s necessary that rural communities should spontaneously coordinate related stakeholders for figure out a way to improve agro-biodiversity and livelihood based on scientific research.
Thanks for your attention