

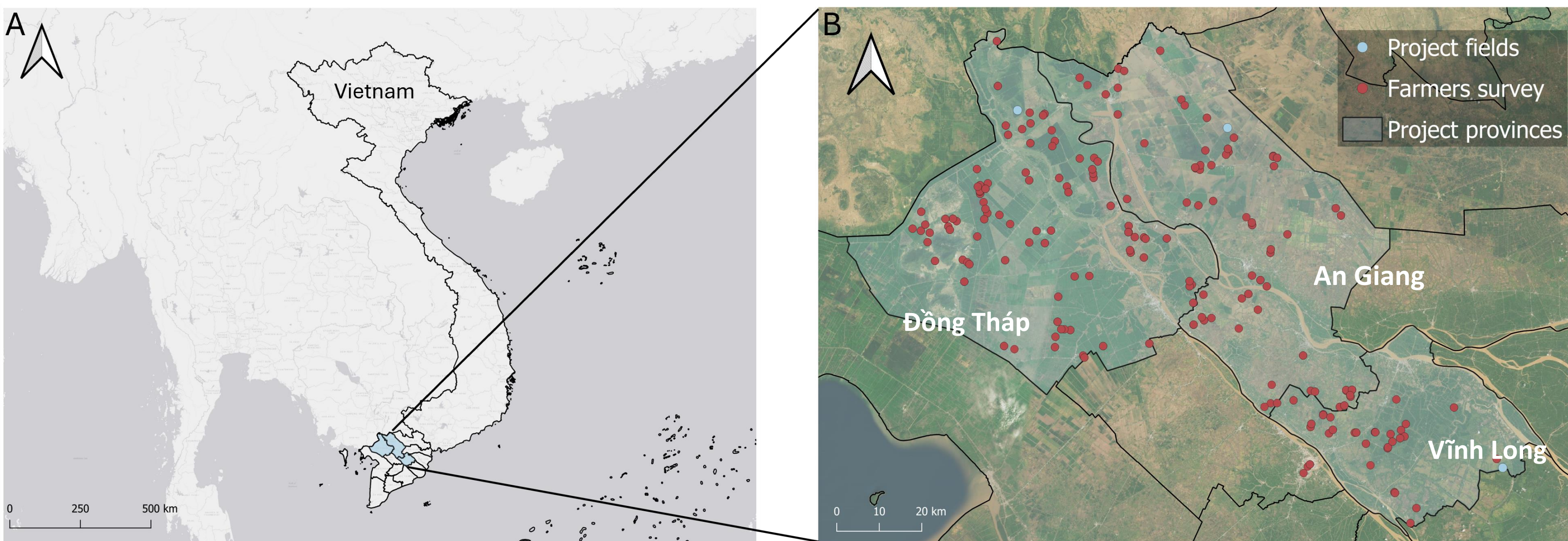
Analysis of the contamination and reduction of pesticide residues during transition from conventional to organic rice production in the Mekong Delta of Vietnam

Linda Klamann¹, Björn Thiele¹, An Giang Cao Dinh², Khoi Chau Minh², Lutz Weihermüller¹

¹Agrosphere Institute, Forschungszentrum Jülich GmbH, Jülich, Germany

²College of Agriculture, Can Tho University, Can Tho, Vietnam

Introduction



Rice cultivation in Vietnam, particularly in the Mekong Delta, is essential for food security and the national economy. The study area comprises Vĩnh Long, An Giang, and Đồng Tháp provinces within the Mekong Delta River Basin. This highly biodiverse area is characterized by fertile alluvial sediments, a tropical climate with temperatures ranging from 25–29 °C, and an average annual rainfall of around 1800 mm. These environmental conditions make the region ideal for intensive rice production. However, the widespread use of pesticides and fertilizers in this agricultural system has raised serious environmental and health concerns. This study investigates pesticide residue levels in the three provinces, aiming to compare differences in pesticide use and pollution among these provinces. Moreover, it assesses the feasibility of transitioning to organic farming practices as a more sustainable alternative.

Methodology

1. Soil Sampling:

Locations and Field Types:

- **Vĩnh Long Province (2023 & 2024):** Certified organic and conventional rice fields
- **An Giang Province (2024):** Fields transitioning to organic rice cultivation
- **Đồng Tháp Province (2024):** Fields transitioning to organic rice cultivation

Sample Collection:

Soil samples were collected during the vegetative phase of the cropping season (April 2023) and the fallow (non-cropping) period in 2024.

Analysis:

Pesticide residues were extracted using accelerated solvent extraction (ASE) and analyzed through targeted pesticide screening via LC-MS/MS.

2. Farmer Surveys:

Focus:

Pesticide use in paddy rice cultivation in Vĩnh Long, An Giang, and Đồng Tháp provinces.

Survey Period:

May 2023 – March 2024.

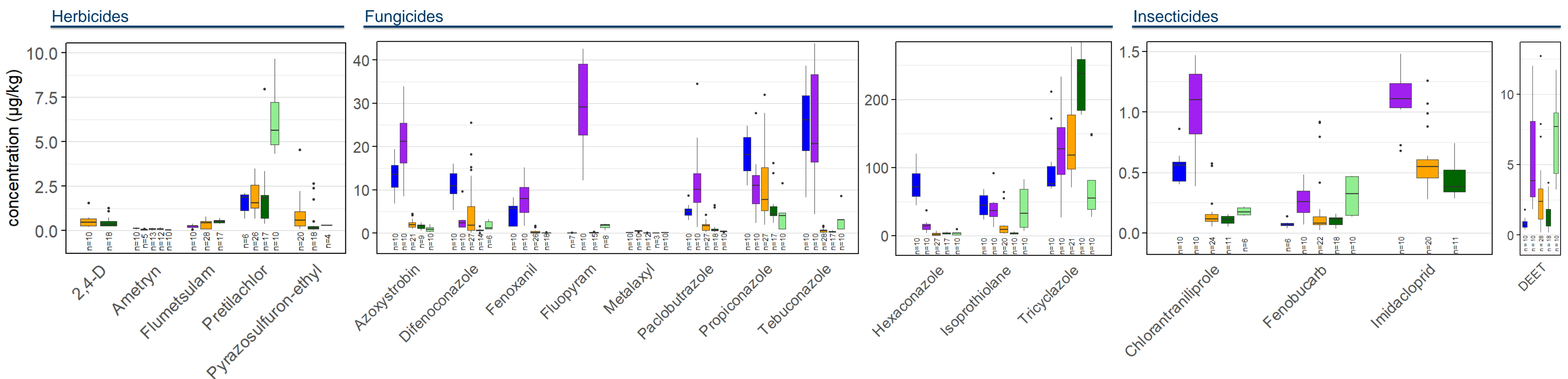
Data Collected:

Information on pesticide types, pest pressure, application frequency and dosage, crop types, and farming practices.

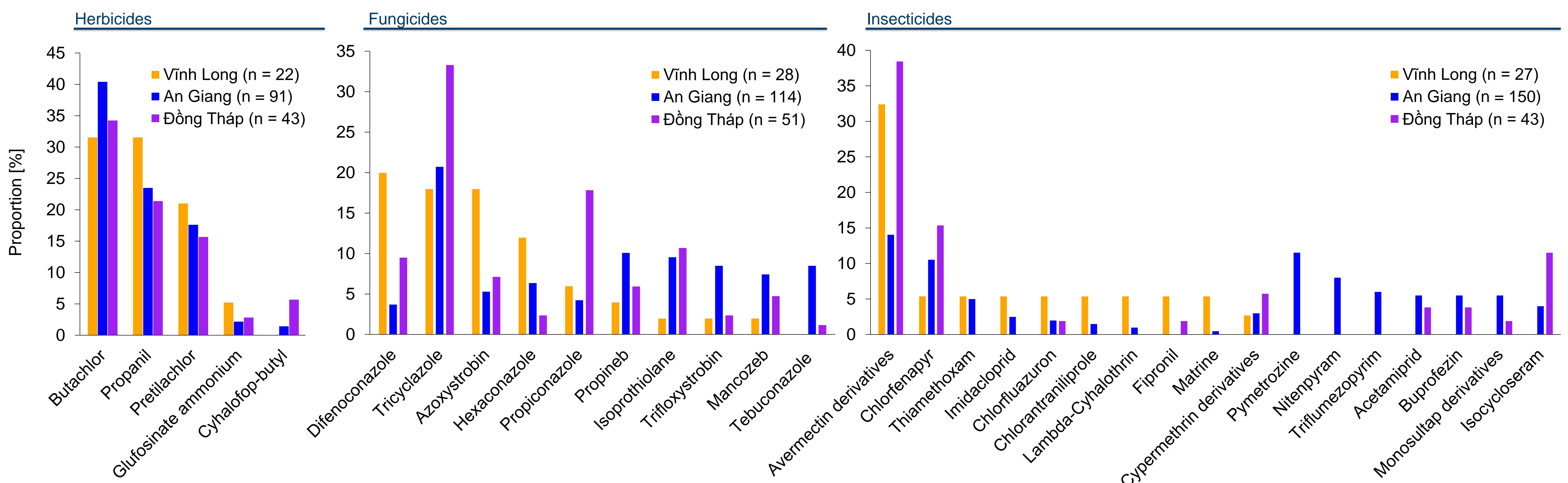
Results

1. Pesticide Residues in Soil Samples

Provinces (sampling year) ■ An Giang (2024) ■ Đồng Tháp (2024) ■ Vĩnh Long Conv. (2023) ■ Vĩnh Long Org. (2023) ■ Vĩnh Long Org. (2024)



2. Pesticide Use According to Farmer Surveys



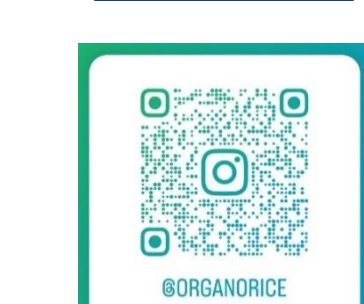
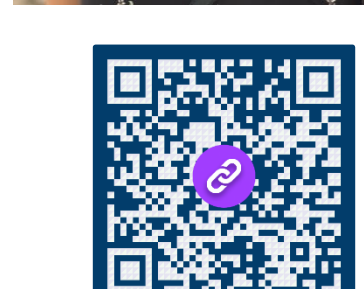
Conclusion & Recommendations

Conclusion

- Pesticides reported by farmers were also detected in soil samples.
- The highest pollution was caused by tricyclazole, a highly persistent pesticide with a long half life value. Its repeated application (2-3 times per cropping season) combined with 2.5 crop rotations per year promotes accumulation in the soil.
- No clear overall trend was observed in pesticide residue application or residue levels between the provinces; however, regional differences were evident for specific pesticides.
- **Alarming finding:** Pesticide residues were also detected in certified organic rice fields.
 - Possible causes include small field sizes (1–2 ha per farmer) and pesticide intrusion from neighboring conventional fields via the complex Mekong Delta river irrigation system.
 - Due to soil properties, leaching into groundwater is minimal; instead, pesticides tend to accumulate on the fields.

Recommendations

- **Farmer cooperatives:** Encourage the formation of farmer groups to combine fields and significantly increase the area under organic rice cultivation.
- **Buffer zones:** Establish buffer zones between organic and conventional fields to minimize pesticide intrusion and protect organic production



Linda Klamann
E-Mail: l.klamann@fz-juelich.de