Biosphere monitoring in agricultural ecosystems with drone-based eDNA surveys

Emanuele Aucone[1,2], Steffen Kirchgeorg[1,2], Prof. Dr. Stefano Mintchev[1,2]

[1]Environmental Robotics Lab, Dept. of Environmental Systems Science, ETH Zürich
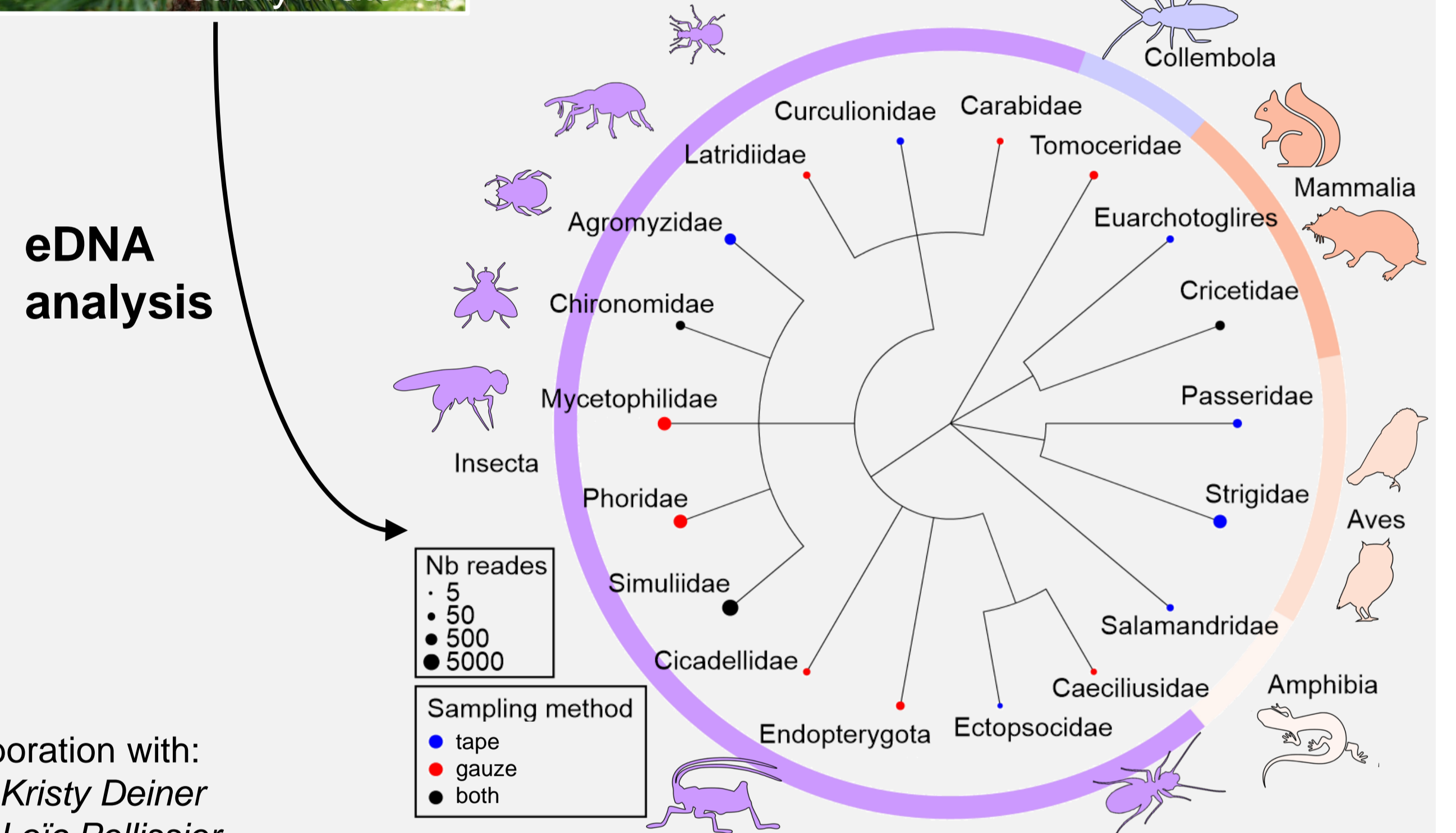[2]Swiss Federal Institute of Forest, Snow, and Landscape Research, WSL

1. Motivation & Method

Growing pressure from **biodiversity loss** and **invasive alien species** threatens **food security** and urgently calls for efficient solutions to **monitor the biosphere**

Credits: Omar de Kok-Mercado – Iowa State University
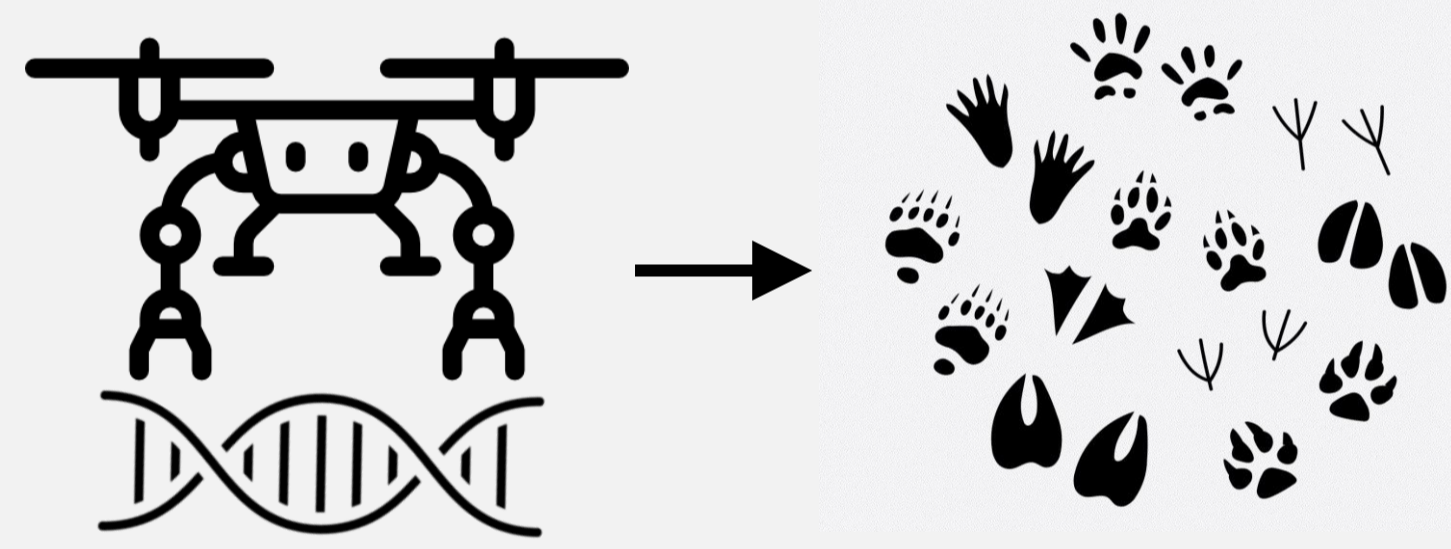
We combine robotics and genetics for accurate, fast and cost-effective biodiversity monitoring

2. Results – Drone-Assisted eDNA survey

eDrone

eDNA survey

eDNA is collected with a sticky material

Credits: Gottardo Pestalozzi

eDNA analysis

In collaboration with:
• *Prof. Kristy Deiner*
• *Prof. Loïc Pellissier*

Aucone et al., Science Robotics, *Under Review*

3. Conclusions

Potential applications of eDrones in agriculture:

• Standardizable methods to **assess the impact of agricultural practices**
• Certification of the **agricultural supply chain**
• **Detection and monitoring of pests** or invasive alien species
• Support the use of **biocontrol** products
• Assessing selectivity and **impact of pesticides**
• …

eDNA collection material
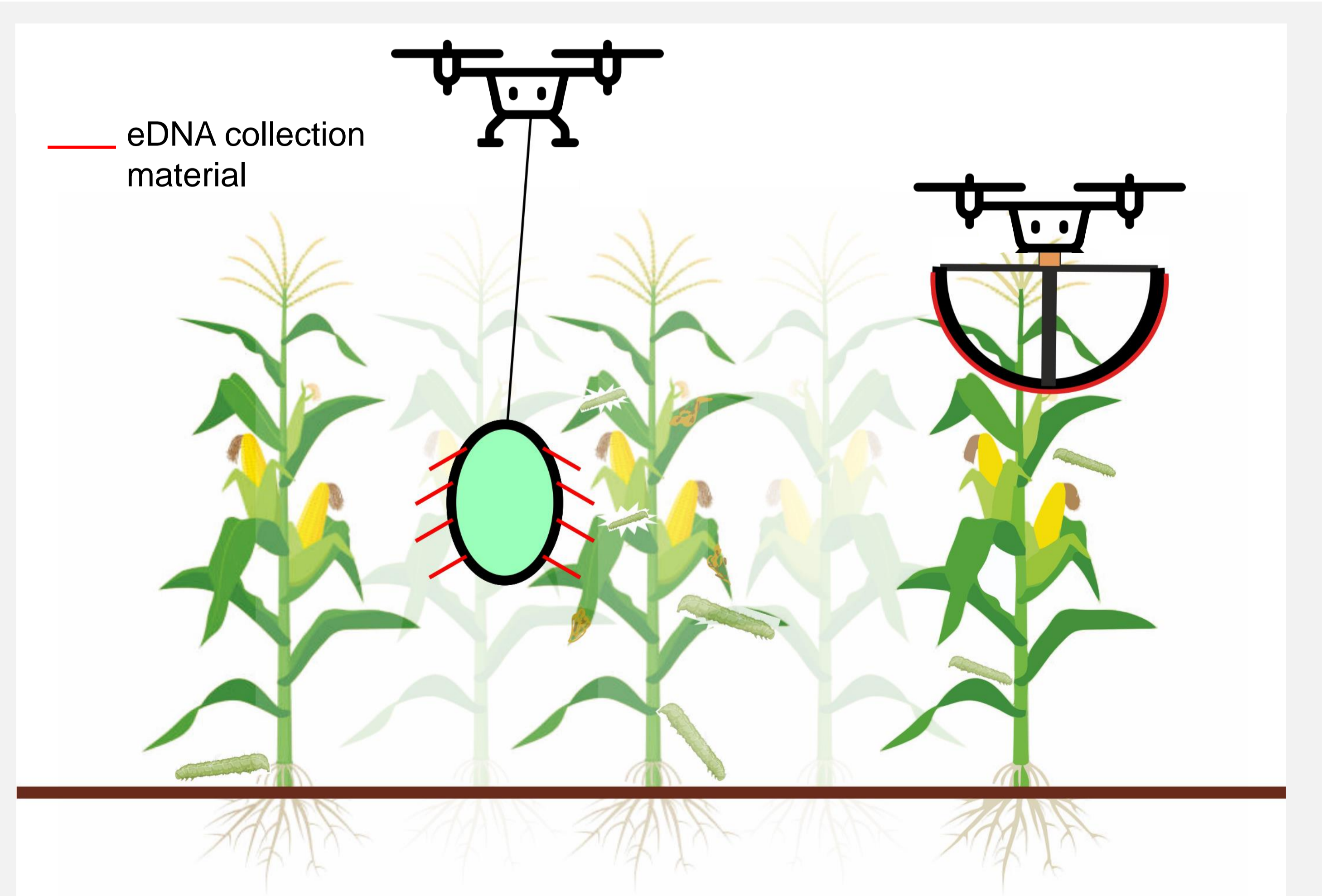
4. Contribution to Sustainable Food Systems

Synergies between robotics and genetics offer a solution for the **rapid, cost-effective, and scalable monitoring of the biosphere**, enabling the collection of actionable data for sustainable agricultural practices (**SDG2**) and the protection and restoration of terrestrial ecosystems (**SDG15**).

Partner/Sponsor: