Forschungsinstitut für biologischen Landbau FiBL
info.suisse@fibl.org | www.fibl.org




Scientific innovation as driver for an organic plant protection transition

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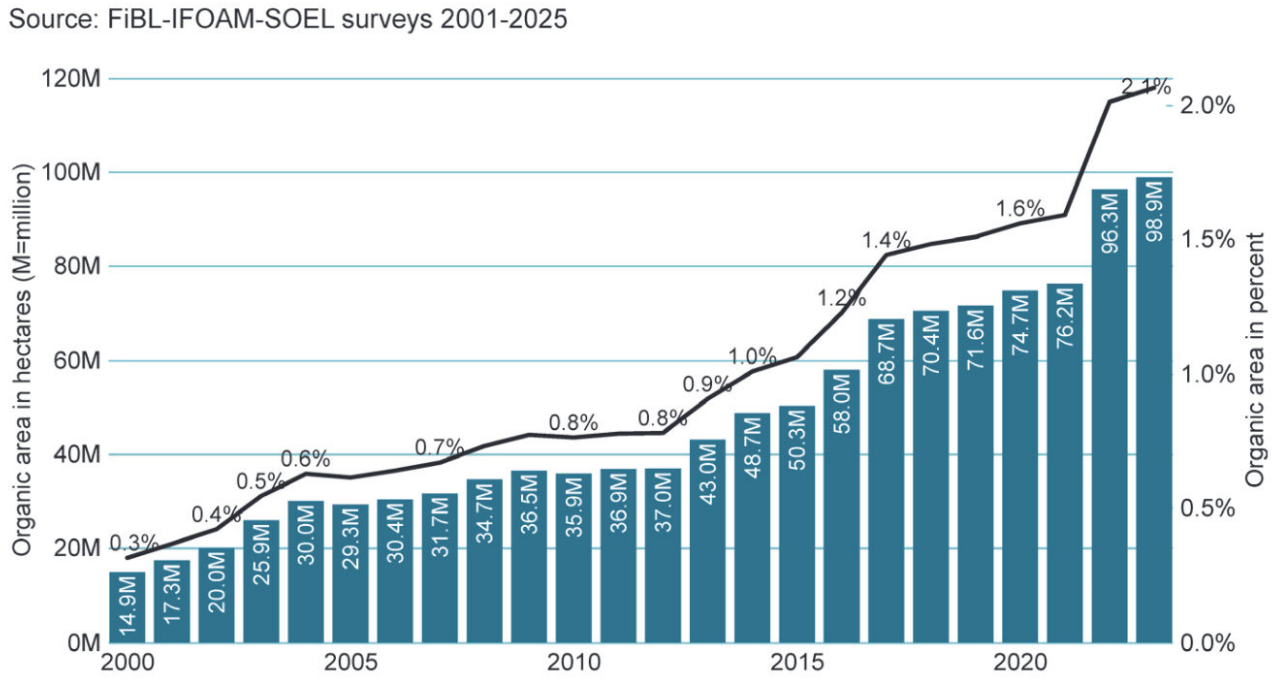
Stefano Torriani – Head of FiBL Crop Science Department – stefano.torriani@fibl.org

Some numbers about organic agriculture

- Global organic farming area expanded by 2.6 percent in 2023
- 98.9 million hectares were managed organically
- 22 countries with >10% of their agricultural land is organic
- Liechtenstein 44.6%, Austria 27.3%, Uruguay 25.4%
- Global market for organic products reached 136.4 billion €
- US (59.0 billion €), DE (16.1 billion €) and CN (12.6 billion €)



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FiBL & IFOAM – ORGANICS INTERNATIONAL

THE WORLD OF ORGANIC AGRICULTURE

STATISTICS & EMERGING TRENDS 2025

OCEANIA 53.2 MILLION HA
EUROPE 19.5 MILLION HA
LATIN AMERICA AND CARIBBEAN 10.3 MILLION HA
ASIA 9.1 MILLION HA
AFRICA 3.4 MILLION HA
NORTH AMERICA 3.3 MILLION HA

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BIOSUISSE

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All FiBL projects are online

https://www.fibl.org/en/themes/crops

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Grassland

Arable crops

Special crops

Cropping techniques

Compost & fertilisation

Crop protection

Seed & plant breeding

Field trials

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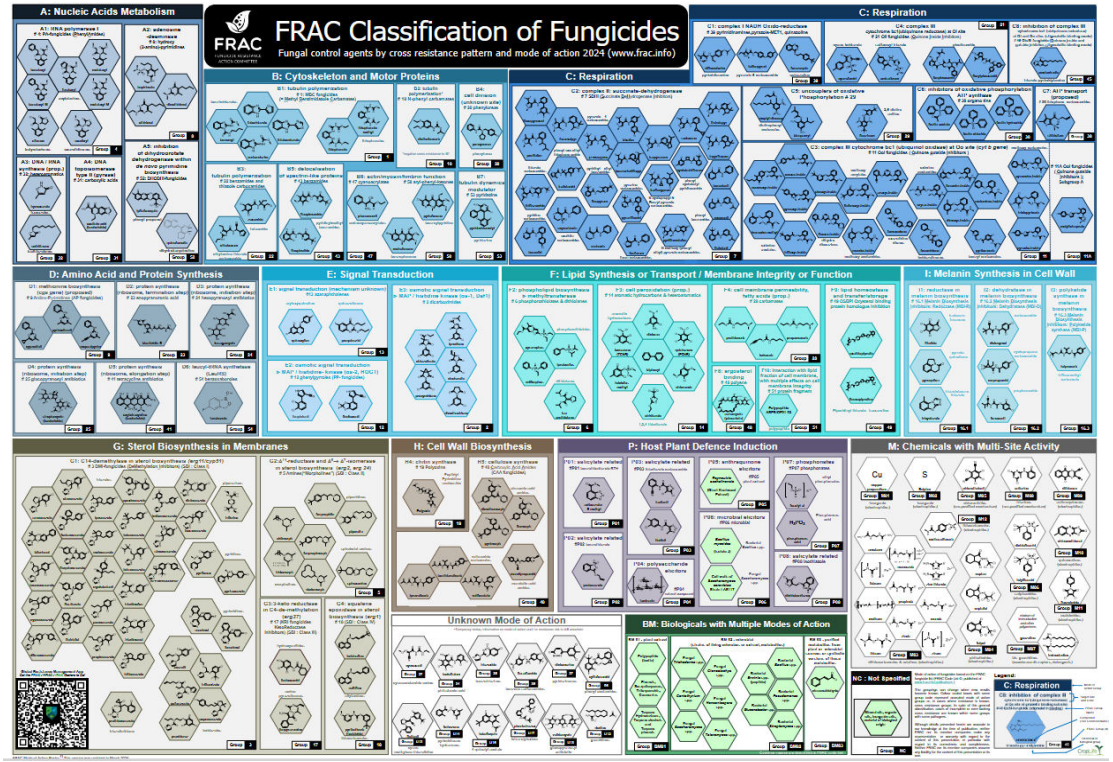
Climate change resilience and adaptation

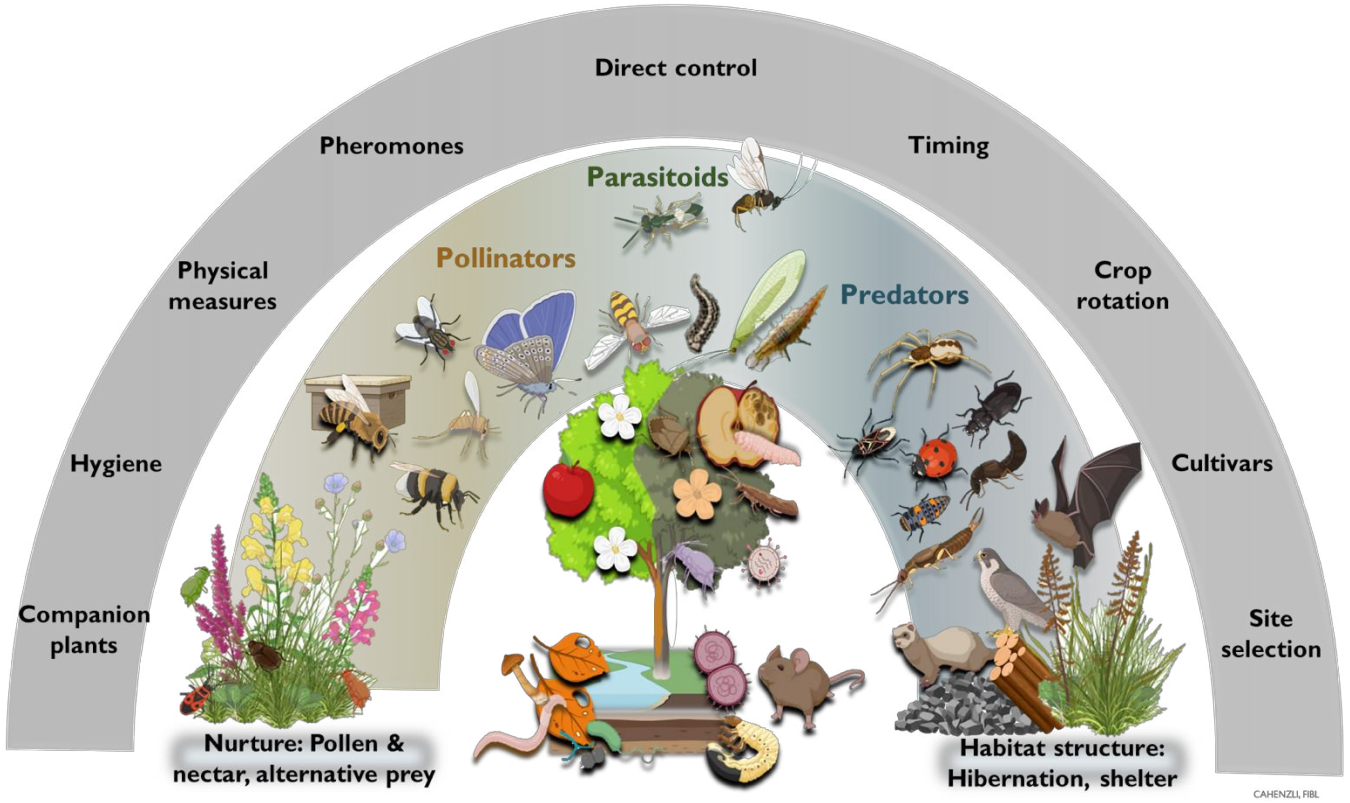
Plant protection One Health

(Fuctional) (Agro) Biodiversity

Breeding and Vvriety selection

https://www.frac.info/





Synthetic pesticides are highly effective due to precise chemical design, which targets specific enzymes critical for fungal survival. Pesticides inhibit key enzymatic processes, such as sterol biosynthesis or mitochondrial respiration

Organic disease control relies mainly on multiple integrated strategies. This holistic and sustainable approach requires transdisciplinary approaches, good coordination and often more time to be successfully implemented.

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Plant protection and agroecology: The crop protection strategies

curative

Direct control

Bio insecticides, fungicides, pheromones, physical measures
Plant extracts, microorganisms, minerals, soaps, oils, polysaccharides, phenomones

Inundative or inoculative biocontrol

Release of beneficial organisms (parasites, pathogens, predators) for pest/disease control
Several species can be used against different development stages of the same pest

preventive

Functional biodiversity

Optimized (wild) flower reservoirs or strips and use of selected companion plants to enhance functional biodiversity increasing and facilitating natural pest control and pollination

Cultural and management practices

Alternative cropping systems (inter-mixed cropping). New push-pull-disruption system for insect control.
Monitoring and understanding the ecology, impact and possible solution against invasive species

Nature conservation measures

Evaluation of the impact of diversified cropping systems. Habitat management (e.g., flower strips/hedges, reservoirs, urban nature and farming) to optimize functional biodiversity. Breeding for organic agriculture

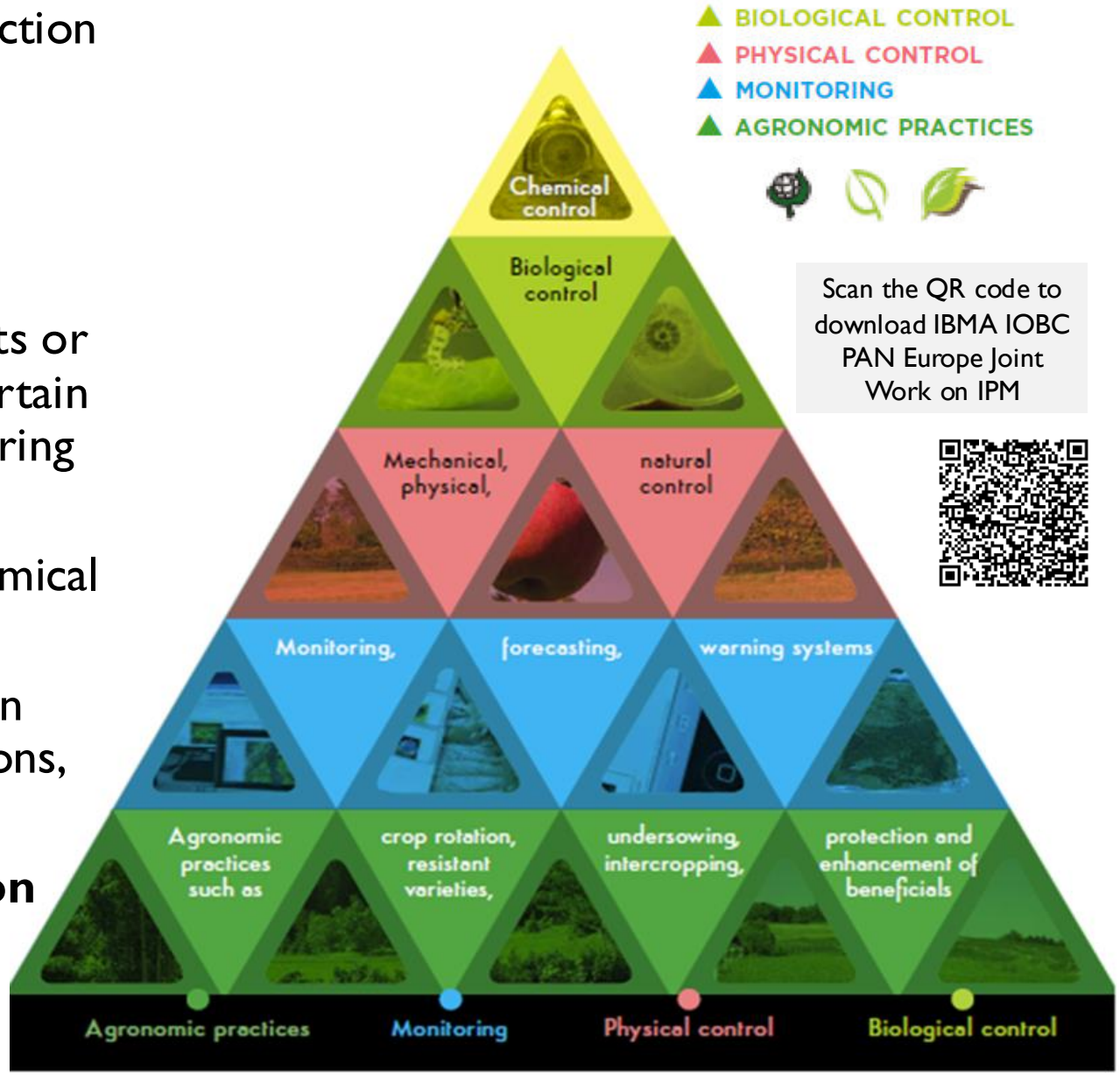
stefano.torriani@fibl.org

Organic plant protection solutions requires a multidisciplinary approach

Compared to chemical controls, organic crop protection is perceived as more difficult to implement.

- Organic solutions often rely on **complex interactions** between plants, pests, beneficial organisms and the environment.
- Biological control agents, such as beneficial insects or microorganisms, are often **highly specific** to certain pests, requiring precise identification and monitoring and management.
- Organic solutions are generally **slower** than chemical pesticides, which offer immediate results.
- The **effectiveness** of single organic solutions can vary widely depending on environmental conditions, pest populations, and other factors.

Organic crop protection require high precision



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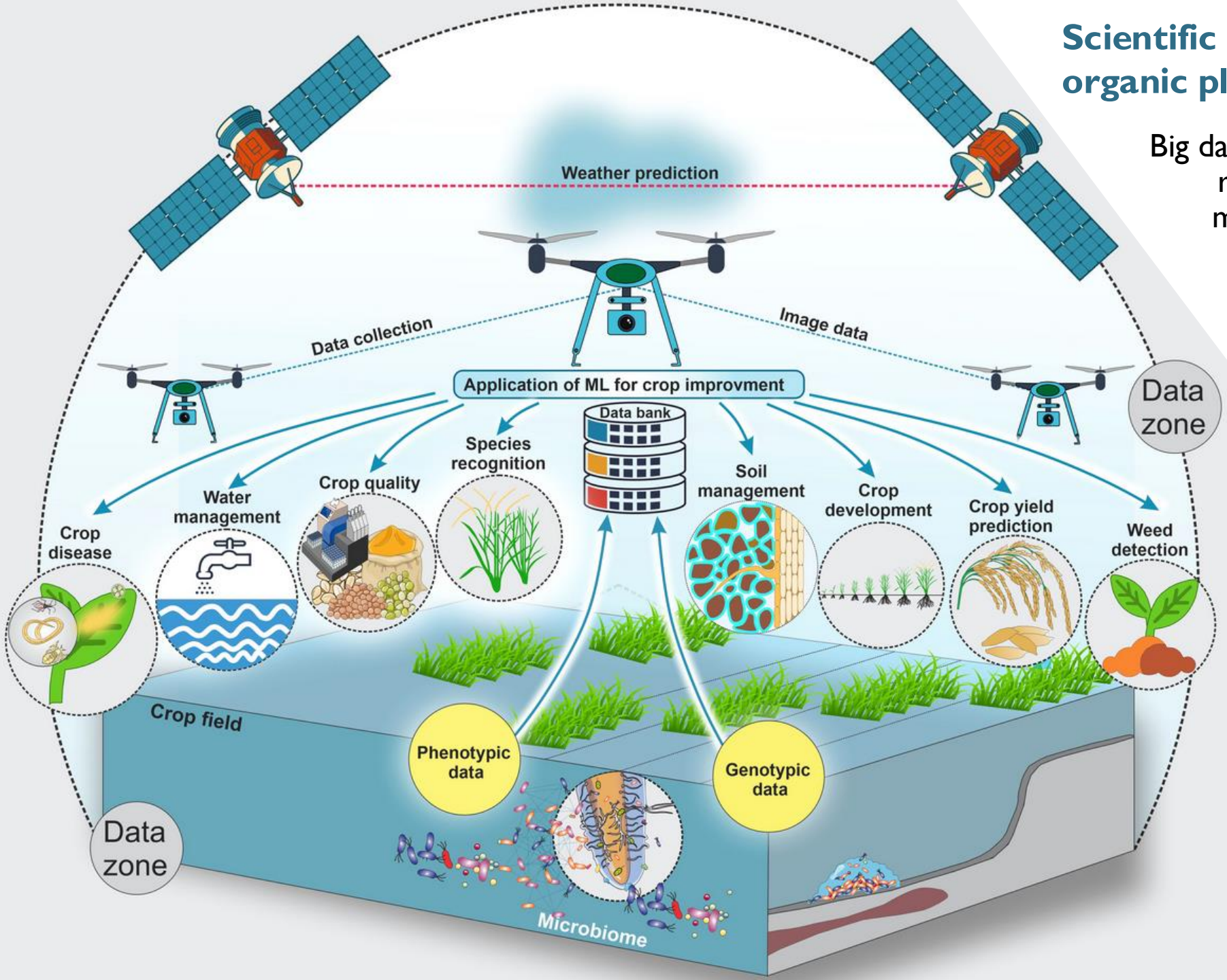
Big data with multi-layer complexity requires a joint effort between multiple research organizations

Analytic pipelines based on machine learning will enable tailored recommendation based on data and scientific approach



Khatibi SMH and Ali J (2024) Harnessing the power of machine learning for crop improvement and sustainable production. Front. Plant Sci. 15:1417912. doi: 10.3389/fpls.2024.1417912

Scan the QR code to access the publication Khatibi and Ali 2024

Thanks for your attention

Scan the QR code to access the Crop Dept projects

Scan the QR code to download IBMA IOBC PAN Europe Joint Work on IPM

Scan the QR code to access Swiss input list

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stefano.torriani@fibl.org