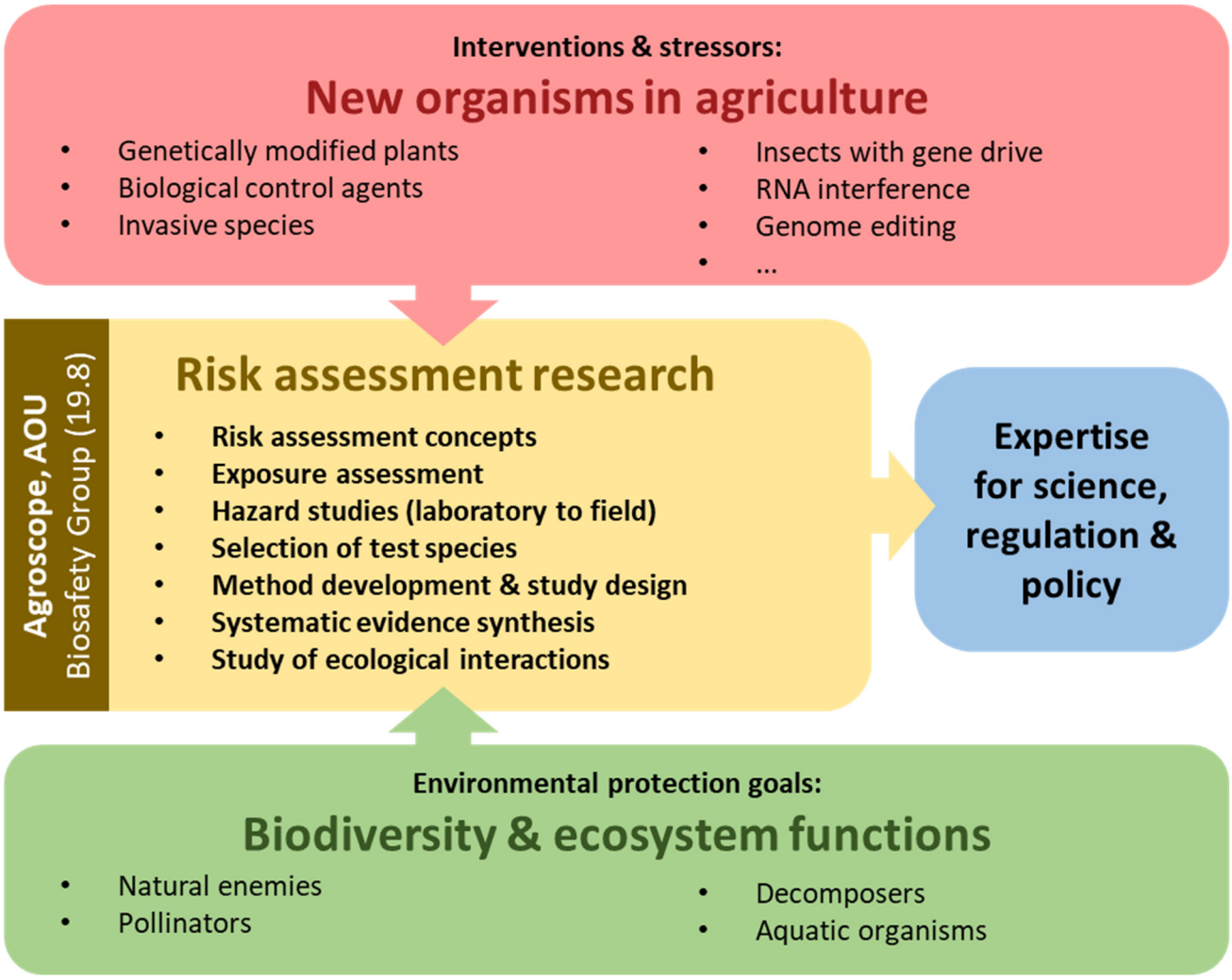
New Organisms in Agriculture – Assessing Impacts on Biodiversity and Ecosystem Functions

Biosafety Research Group, Research Division Agroecology and Environment (AOU)

Focus

Sustainable, environmentally friendly agriculture relies on a diverse agricultural landscape and its ecosystem functions, such as control of pests, pollination, and decomposition. Arthropods contributing to those functions are therefore valued. Organisms that are deliberately released to protect or enhance yields or product quality or that become accidentally introduced from other world regions potentially threaten native species and their functions. To maintain a functioning agroecosystem, we need to know the environmental impacts of such new organisms in Swiss agriculture and beyond.



In the Biosafety Research Group at Agroscope, we develop concepts for environmental risk assessment and conduct experimental research to assess exposure of arthropods to new stressors. We study potential hazards in the laboratory, glasshouse, and field. We generate knowledge that helps to select suitable test species and we develop methods and designs for impact assessment studies. Finally, we synthesize existing knowledge in a transparent and comprehensive way (systematic reviews) and we fill knowledge gaps by studying ecological interactions of plants and insects.

By publishing our findings, participation in national and international events, and engagement in expert panels, we provide expertise for science, regulation and policy.

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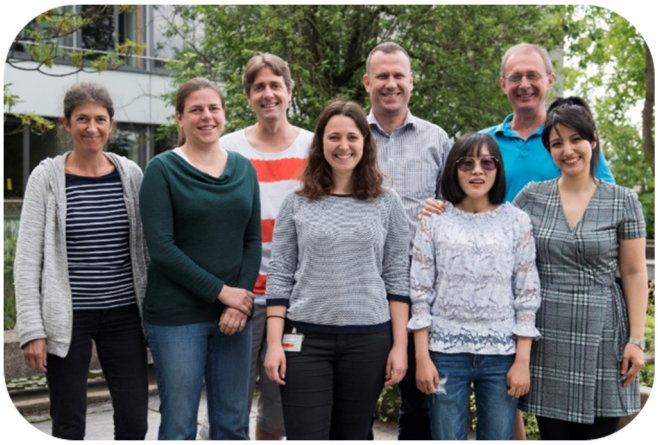
Background

The biosafety research group was founded in 2000. Since then, we built up expertise in particular in the environmental risk assessment of genetically modified plants and biological control agents. Members of the group have published more than 200 papers on those topics and provide expertise to national (BLW, BAFU) and international (EPPO, EFSA, CBD) organizations. The experience with conceptional and experimental work gathered over time is well applicable to new organisms and technologies that challenge agriculture currently and in the future because of biotechnological advances, globalisation and climate change.



Teaching

University of Bern (CH); ETH Zürich (CH); ISARA Lyon (France)

Key International Collaborations

USDA-ARS (USA) & Cornell University (USA); Chinese Academy of Agricultural Sciences (China); CABI (CH, China); Julius Kühn Institute (Germany); University of Innsbruck (Austria)

Selected Publications

- Collatz *et al.* (2020) Benefits and Risks. In Mason (Ed.) Biological Control- a global endeavor. CSIRO Publishing
- Romeis J, Meissle M (2020) Multiple insecticidal Bt proteins in stacked GE crops pose no new risks to non-target arthropods. *Trends Biotech* 38, doi: 10.1016/j.tibtech.2019.12.001
- Schiemann *et al.* (2019) Risk assessment and regulation of plants modified by modern biotechniques: current status and future challenges. *Annu Rev Plant Biol* 70, 699-726
- Romeis *et al.* (2019) Genetically engineered crops help support conservation biological control. *Biol Contr* 130, 136-154
- Haller *et al.* (2019) Responses of two ladybird beetle species (Coleoptera: Coccinellidae) to dietary RNAi. *Pest Manag Sci* 75, 2652-2662
- Wolf *et al.* (2018) A simple and cost-effective molecular way to track predation on *Drosophila suzukii* in the field. *J Pest Sci* 91, 927-935
- Svobodová *et al.* (2017) Stacked Bt maize and arthropod predators – Exposure to insecticidal Cry proteins and potential hazards. *Proc Royal Soc B* 284, 20170440
- Mason, *et al.* (2017) Harmonizing the regulation of invertebrate biological control agents in the EPPO region: using the NAPPO region as a model." *EPPO Bull* 47, 79-90
- Knoll *et al.* (2017) Seasonal and regional presence of hymenopteran parasitoids of *Drosophila* in Switzerland and their ability to parasitize the invasive *Drosophila suzukii*. *Sci Rep* 7, 40697
- Devos *et al.* (2015) Optimising environmental risk assessments. Accounting for ecosystem services helps to translate broad policy protection goals into specific operational ones for environmental risk assessments. *EMBO Rep* 16, 1060-1063
- Romeis *et al.* (2014) Potential use of an arthropod database to support the non-target risk assessment and monitoring of transgenic plants. *Transgenic Res* 23, 995-1013
- Bacon *et al.* (2014) Quarantine arthropod invasions in Europe: the role of climate, hosts and propagule pressure. *Diversity Distrib* 20, 84-94
- Romeis *et al.* (2013) Deriving criteria to select arthropod species for laboratory tests to assess the ecological risks from cultivating arthropod-resistant genetically engineered crops. *Chemosphere* 90, 901-909
- Sanvido *et al.* (2012) Evaluating environmental risks of genetically modified crops – ecological harm criteria for regulatory decision-making. *Environ Sci Policy* 15, 82-91
- Romeis *et al.* (2011) Recommendations for the design of laboratory studies on non-target arthropods for risk assessment of genetically engineered plants. *Transgenic Res* 20, 1-22
- Meissle *et al.* (2011) Bt maize and integrated pest management – a European perspective. *Pest Manag Sci* 67, 1049-1058
- Aebi *et al.* (2011) Detecting arthropod intraguild predation in the field. *BioControl* 56, 429-440
- Romeis *et al.* (2008) Assessment of risk of insect-resistant transgenic crops to nontarget arthropods. *Nat Biotech* 26, 203-208
- Bigler *et al.* (Eds) (2006) Environmental Impact of invertebrates for Biological Control of Arhropods. CABI Publishing

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