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APPEAL – Assessment and valuation of pest suppression potential through biological control in European agricultural landscapes

Biological pest control provided by natural enemies is an ecosystem service of immense economic value, threatened by agricultural intensification. It is a service for which great amounts of background information have been gathered and it is, therefore, an excellent study system for exploring generalities of delivery, stability and value of services in relation to land use, biodiversity, and society.

APPEAL investigates a) the relationship between land use and biodiversity, b) biodiversity and the ecosystem service of biological control and c) provide a framework for estimating the value of biological control. As a model pest, APPEAL uses cereal aphids, which are among the economically most important insect pests in Europe. These aphids are attacked by a range of natural enemies such as lady beetles, ground beetles and spiders, and the biological control service provided by these species is known to be substantial.

APPEAL uses historical records and current data to analyze how changes in the natural enemy fauna are influenced by land-use change. In order to achieve understanding on a mechanistic level, a food-web approach is used, employing molecular methods and field experiments. A valuation framework will be developed that can model biocontrol of cereal aphids across European landscapes.

Key research questions that are addressed within APPEAL are:

1. How do natural enemy communities vary temporally and spatially and how does this affect the stability of biocontrol services?
2. Are food-web structure and interactions affected by landscape composition, and what implications does this have for biological control?
3. How do biocontrol services vary across agricultural landscapes and where are areas with a surplus or deficit of the services located across Europe?
4. What are the advantages and disadvantages of biological control in terms of monetary and non-monetary values as compared to conventional plant protection?

APPEAL is developing a modelling tool that can be used both by pest management practitioners (to design integrated pest management programs) and policy-makers (to explore the impact of land-use change on biocontrol services and crop production). The results generated by APPEAL will lead the way to assess multiple ecosystem services by providing a clear and easily adaptable structure for incorporating ecosystem service values into land-use change scenarios.

