

## **“Solar Beneficial Insects”: promoting beneficial arthropods in agrophotovoltaic systems**

KATHLEEN LEMANSKI\* & ANNETTE HERZ

*Julius Kühn Institute (JKI), Federal Research Institute for Cultivated Plants, Institute for Biological Control, Schwabenheimer Straße 101, 69221 Dossenheim  
\*E-Mail: kathleen.lemanski@julius-kuehn.de*

In order to achieve climate protection targets set by the German Government, an enormous expansion of renewable energy will be necessary, including photovoltaic (PV) systems. To avoid a land-use conflict between agriculture and energy production, agrophotovoltaic (APV) systems could be increasingly used. In APV systems, the PV modules are either installed elevated above the crop itself or vertically next to the crop, so that the area below or in between the modules can still be used for agriculture. Currently, there is still a substantial knowledge gap regarding the compatibility of the dual agricultural and PV use. Especially, the potential impact on the functional biodiversity as an important guarantor for healthy crops is still unexplored in APV systems. Therefore, the aim of this research project is to determine how APV systems can be designed to support settlement and promotion of beneficial arthropods and hence reduce certain pests.

The project has started recording and evaluating current activities regarding APV systems in Germany, especially with respect to functional biodiversity. In cooperation with operators of APV systems the diversity and abundance of beneficial arthropods around existing APV systems, with a focus on hoverflies, sphecoid wasps (Hymenoptera: Apoidea) and spiders will be investigated. In order to promote beneficial insects, the project will also develop and field-test the performance of various elements that can be integrated in APV systems (e.g., flowering strips or nesting aids installed in the mounting framework). Additionally, the project aims to investigate whether the PV modules themselves have a direct influence on specific beneficial insects and pests, e.g., a repelling or attracting effect. Overall, the project aims at providing knowledge about how APV systems can be designed in an environmentally friendly way, generating additional benefit to agriculture through pest control and pollination.

## **„nützLINK“ – a Citizen Science based approach to monitor beneficial arthropods in agricultural landscapes in Germany**

ANNETTE HERZ, FELIX BRIEM, ELENA FRÜCHTENICHT, HANNAH HAMM, PHILIPP KASSEL, MAXIMILIAN PINK, MAXIMILIAN SITTINGER & JOHANNES UHLER,

*Julius Kühn Institute (JKI), Federal Research Institute for Cultivated Plants, Institute for Biological Control, Schwabenheimer Straße 101, 69221 Dossenheim  
E-Mail: Annette.Herz@julius-kuehn.de*

The global loss of biodiversity and in particular the decline of insects has serious consequences for many ecosystems worldwide. In agriculture, important ecosystem services such as crop pollination and natural pest control are at risk. Due to

agricultural intensification, beneficial arthropods such as predators and parasitoids are frequently exposed to pesticides and fertilizers. Lack of (semi-)natural structures prevents them from recovering in habitats less polluted by chemical inputs. Regular monitoring of their populations in agricultural landscapes is therefore necessary to detect changes in their communities and disturbances of their ecosystem services. On the other hand, a standardized monitoring program may also help to record positive effects of agroecological measures on biodiversity. Adult hoverflies are important pollinators, while the larvae of many species are effective predators of various field crop pests (e.g. aphids). Establishing a long-term monitoring of their populations will serve as an indicator of the condition of agricultural landscapes as part of the collaborative project MonViA\* (National Monitoring of Biodiversity in Agricultural Landscapes). Due to their life cycle and high mobility, many hoverfly species roam in very different habitats. Their populations are influenced by the availability of resources and potential disturbance factors across a wide spatial range. Orchard meadows embedded in the agricultural landscape are extensively managed agroforestry systems that provide temporary refugia and resources for many insect groups, including hoverflies. As low-disturbance ecotones, they can serve as a spatial matrix for establishing a long-term monitoring of the target insect taxa. Furthermore, many orchard meadows are maintained by citizens, communities and associations. This network of interested stakeholders can contribute to document the occurrence of hoverflies and other beneficial insects within the Citizen Science approach „nützLINK“ of our project (<https://www.agrarmonitoring-monvia.de/en/news-details/nuetzlink-goes-online>). The recording of parameters such as biomass, abundance and diversity of the target taxa, and the assessment of their population trends is currently performed with a combination of traditional (yellow pan traps, malaise traps) and new methods where Citizen Scientist can be involved. These methods include the use of eDNA analyses\*\*, the development of artificial flowers and a camera trap for automated monitoring of flower-visiting insects. The concept of this monitoring program and initial results are presented in this paper.

\* On behalf of the Federal Ministry of Food and Agriculture, a total of 12 specialist institutes of the Thuenen Institute and the Julius Kühn Institute as well as the Federal Office for Agriculture and Food are working together in the project MonViA (<https://www.agrarmonitoring-monvia.de/en/>).

\*\* in cooperation with Sinsoma GmbH, Austria