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R2D2: a territorial project to prevent pest damages on winter oilseed rape combining agronomy and conservation biological control

Background:

Preventing pest damages on winter oilseed rape (WOSR) is a major issue for farmers, particularly in European pyrethroid resistance context concerning cabbage stem flea beetle (*Psylliodes chrysocephala*) and rape winter stem weevil (*Ceuthorrhynchus picipitarsis*). R2D2 project was born in Burgundy (France) in 2018 to address this issue in conventional agriculture, combining crop robustness levers and conservation biological control at territorial scale.

Objective:

R2D2 support 10 farmers on a 1300 ha area located on the Burgundy plateaus to design, test, evaluate and gradually improve a collective agroecological insect pests management project at territorial scale which would make it possible to dispense with the use of insecticides.

Methods:

The first step of this generative experiment was to have the farmers expressing the target to be reached in 5-10 years: having profitable cropping systems including WOSR managed without insecticides. Then, farmers have been supported to test new farming practices and innovative large-scale concerted actions such trap crops techniques and setting up of agroecological infrastructures. Project evaluation was done thanks to a scientific observation network which allowed to collect data on pest pressure and natural regulations and through inquiries to assess changes in farming practices and decision-making processes relative to pest management. Finally, cropping systems performance assessment was done using SYSTERRE® multicriteria assessment tool.

Results:

After two years, significant changes have occurred in both farmers' pest management strategies and practices. On WOSR, they have appropriated new cultivation techniques to enforce crops' robustness. They were also testing Chinese radish-based cover crops to trap cabbage stem flea beetles and reduce their populations and have sown 8 ha of flower strips to enhance beneficial arthropods. Those changes went with a decrease of systematic insecticides treatments on WOSR from 60% to 0% between 2019 and 2021 as well as the treatment frequency index (TFI) that was dropped by 51% during the same period to reach 1.27. On the contrary, on pea and winter barley for which alternative agronomic levers are scarce, insecticide TFI increased significantly. No trend seems to emerge yet for WOSR beetle pests' natural regulations which are relatively moderate and does not exceed 37% all species combined.

Conclusions:

Two years after its beginning, R2D2 project has shown that farmers could quickly appropriate new cultivation techniques and reach good performance though in a difficult context characterized by high pest pressure and resistance phenomenon. Farmers have also demonstrated their capacities to coordinate large-scale actions with the test of trap cover crops concept which is very original and promising. Although, collective pest management strategies require a change of paradigm, i.e., to move from individual and curative chemical-based strategies to preventive and holistic approaches based on a combination of partial effect-levers. To be successful, this shift requires the availability of effective crop robustness levers. Finally, the project highlights a real need for methods and tools to support farmers and help them to progress towards their target, and also to create knowledge for a better understanding of harvest loss risk linked to insect pest pressure.