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GRAAL - Management of a permanent cover crop by mowing between the rows of a main crop

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1. Introduction

The current societal, political, and regulatory context is leading farmers to search and develop low-input cropping systems based on agroecological levers. Sowing a permanent cover crop, usually legumes, in organic arable farming systems is an interesting lever for (i) increasing the quantities of N entering the system and which can be used by cash crops (Amossé *et al.*, 2014; Guiducci *et al.*, 2018), (ii) better managing weed flora, through better use of space and increased competition (Amossé *et al.*, 2013), (iii) improving soil fertility (Duchene *et al.*, 2017; Nyawade *et al.*, 2019). One of the major difficulties lies in the management of the permanent cover in cash crops, to prevent it from competing too much with the crop and to provide the targeted services (Verret *et al.*, 2017). To achieve these objectives, an inter-row mowing technique based on precise satellite guidance has been developed thanks to a collaboration with an agricultural machinery manufacturer. This technique was tested on different plots and in different production contexts during the years 2021-2023. The aim of this study is to draw up an initial assessment of the agronomic performances obtained, the difficulties encountered and the levers identified to overcome them.

2. Materials and Methods

The experiments were carried out at 5 experimental sites in France, covering a wide range of agropedoclimatic conditions. On each site, different types of permanent cover were studied (alfalfa, trefoil, clover and sainfoin) and sown between the rows of cash crops with a width of 30 cm. A cash crop control without permanent cover was also established. The cover crops were managed by regular mowing, with 2 to 3 cuts during the cash crop cycle.

Agronomic monitoring consisted of regular measurements of mineral N residues, measurements of the biomass of ground cover returned to the soil and all the components of cash crop yields. In order to collect feedback from the various experimentation managers, interviews were carried out and provided a better understanding of the difficulties encountered in implementing the practice.

3. Results and Discussion

Over the two cropping seasons, difficulties were encountered in implementing the practice of regular mowing of perennial legumes. For all the sites, grain cereal yields in treatments with one or two years old perennial cover were 2 to 25 q/ha lower than those obtained in the controls. These results can be explained by strong and rapid competition from perennial cover crops, poorly managed in particular by (i) difficulties in accessing mowing equipment at the right time, (ii) weather conditions that did not always allow the mower to be used at the right stage, or (iii) poor positioning of crops when sowing. However, protein levels improved overall, partly because of the lower yields. Furthermore, the performance obtained varies between species, with alfalfa phenotypes better adapted to this type of management.

Despite the difficulties encountered, a number of lessons can be learned and a multi-criteria analysis will enable us to identify the positive and negative effects obtained, and to formalise the obstacles and levers to the implementation of this practice. Many organic farmers and researchers are interested in the results of the GRAAL project (funded by the French Ministry of Agriculture). Overcoming the technical difficulties encountered could mean that managing a permanent cover crop by mowing the inter-row could become a practice that promotes the agro-ecological transition of farming systems.

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