

Practice Abstract N° 30

Agroecological & autonomous weed management practices

INTRODUCTION

Weed management is an essential orchard cultural practice that limits competition between crops and weeds for soil resources. Various methods are employed to control weeds and reduce this competition, thereby optimizing yields like cultural, physical, chemical, thermal and biological strategies. In recent years, automated weeding robots have demonstrated significant potential in mechanizing this process, enhancing its efficiency and mitigating its environmental impact. As part of the GOOD project, two experimental studies were conducted in apple orchards at the CTIFL center in Lanxade, France, in 2024 and 2025. The trials aimed to compare conventional weeding techniques with a new autonomous weeding technology using an agricultural robot, and to study the robot's mowing efficiency and suitability for the specific production conditions of an apple orchard. Four weeding strategies were used: T0 (chemical weeding), T1 (mechanical weeding), T2 (high intensity robot weeding) and T3 (low intensity robot weeding).

MAIN RESULTS – OUTCOMES

A comparative analysis of the various weeding strategies employed in these trials enabled their technical, agronomic and economic performance in orchards to be evaluated. The average weed height values obtained from the various measurements taken in the row between 30 April and 3 October 2025 show that the T3 treatment (low-intensity robot; 14.9 cm) results in significantly higher weed height than the T0 treatment (chemical; 9.1 cm), the T1 treatment (mechanical; 10.6 cm) and the T2 treatment (high-intensity robot; 9.1 cm). However, the intensity of robot activity under T2 is relatively high, making implementation on a large scale in real production conditions difficult. Although weed development was controlled under T2 in these trials, the autonomous weeding solution could not be demonstrated to be a cost-effective alternative to conventional weeding strategies. It is therefore worthwhile to continue this work in future research projects to continue identifying and evaluating innovative, agroecological, and economically affordable weeding practices.



PRACTICAL RECOMMENDATIONS

New autonomous and robotic weeding technologies show promise in arboriculture. However, further technological development is needed to adapt these solutions to orchard conditions and respond to economic and technical challenges, thereby facilitating their adoption by growers.

