Evaluation of Precision Sprayer Technologies practical application.

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**Abstract.** The difficulty of appreciating the benefits of precision agriculture (PA) is among the main reasons for its low adoption rate. Concerning crop spraying, the present study focuses on analyzing both economic and ergonomic advantages in adopting precision spraying technology and the approach for a farmer to perform precision spraying tasks. The purpose of the work is to underline that PA management can result in various levels of precision and complexity: some operations may even now be ready for implementation; however, others could require additional economic efforts or consultants.

The study starts with the description of the necessary technical requirements for erbaceous crops. Then, it considers the tractor-implement coupling to manage specific PA sprayers. In practice, upgrading the system precision requires the adoption of a double frequency antenna on the tractor (L1 and L2) for geolocation; it requires also auto-guidance, a virtual terminal and ISOBUS implements. RTK antenna would be preferable for this operation, but not mandatory. Even the software could require upgrading (with an additional fee, too) to have the possibility of managing additional tools.

The experiment compared crop spraying with a conventional 63 kW tractor and sprayer and a 65 kW PA tractor with an ISOBUS sprayer boom, 15 m width. The ISOBUS sprayer worked with variable sections at fixed rates, not using prescription maps. The operators carried out a whole working day, and the field efficiency and the distributed product were evaluated. The PA operator resulted in a field capacity of 40% and a product saving of about 10% higher. The reasons for this difference are analyzed in detail and reported.

Literature reports mean advantages of 20-30% of product and time saving, but these data have to be fitted on the specific kind of performed operation, but they cannot be generalized.

The methodology of the tests conducted with the PA machines also requires attention and the reasons are given. Finally, the cost analysis of the two different fleet management are reported. Results highlighted that the tractor's technological level is fundamental to achieving the desired level of PA.