

Exploring Farmers' Perspectives on Laser Based Weeding

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1. Introduction

Sustainable agriculture has increasingly attracted attention due to the rapid population growth and negative impacts of current agricultural practices on the environment (Rübcke von Veltheim, Theuvsen, & Heise, 2022). Pesticide use reduction and organic farming expansion are among the main targets aimed by the European Green Deal (European Commission, 2020). Remarkably, the recent development of laser weeding treatments using artificial intelligent recognition systems shows the potential to eradicate weeds for sensitive crops, which normally cannot tolerate heavy mechanical weeders (Andreasen, Scholle, & Saberi, 2022). Such an innovative system may facilitate the establishment of organic farming for sensitive crops by providing an economically feasible solution to organic weed control. However, an insight into farmers' attitudes towards such equipment is currently missing. The identification of farmers' needs for the new agricultural machinery would lay a solid foundation for the successful development and implementation of such a system. Also, it would be scientifically of interest to investigate the factors affecting the transition from conventional weeding techniques to laser weeding treatment. Concerning the mentioned literature gaps, this study aims to explore farmers' preferences for laser weeding systems as well as to identify the determinants of their preferences for such an innovative system.

2. Methods

An online-based survey was designed and distributed to crop farmers in Belgium, the Netherlands, Italy, Spain, Poland and Denmark to provide a broad understanding of European farmers' perceptions regarding the proposed system. For each country, 50 respondents will be collected by a market research agency.

The first part of the survey collects farm/farmer related data and information about their current weeding methods and usage of precision agriculture technologies. Subsequently, farmers' intentions to adopt laser-based weeding equipment is examined. Respondents could choose for multiple options: "use it immediately on my farm", "plan to use it on my farm in the future, even when no one I know has used it", "plan to use it on my farm in the future if some of the farmers I know start to use it", "plan to use it on my farm in the future if most of the farmers I know have used it" and "not plan to use it". Furthermore, their intention to adopt laser-based weeding equipment under specific external scenario's (e.g., labour shortage) was measured on a 5-point likelihood scale. The final part of the survey consists of the constructs from the technology acceptance model (TAM), perceived usefulness and perceived ease of use (Davis, 1989; Davis et al., 1989). This is complemented by other constructs identified in literature as relevant in the decision to adopt sustainable practices and precision agriculture, such as environmental concern (Läpple and Kelley, 2013), social influence (von Veltheim et al., 2021) and technical interest (von Veltheim et al., 2021).

The impacts of farm/farmer characteristics, knowledge and attitudes towards precision agriculture, and external factors on farmers' intentions to adopt laser weeding systems will be examined by conducting an ordinal logistic regression.

3. Results

The present study aims to investigate the intentions of European farmers to adopt laser-based weeding equipment, and examine the external factors and farm/farmer characteristics that may influence their decision-making. The study will analyse data from different European countries, with data analysis expected to conclude by the 14th of May. It is anticipated that external factors such as labour shortage, technical assistance, compatibility with other machinery, etc., will positively influence farmers' intentions to adopt laser-based weeding equipment. Additionally, farm/farmer characteristics, knowledge, and attitudes towards precision agriculture are expected to significantly affect farmers' preferences.

This study will provide valuable insights into the attitudes of European farmers towards more sustainable weeding practices, with favourable policies and stringent regulations towards chemical weeding anticipated to have a positive impact on their attitudes. The findings from the study will offer critical information for policymakers and marketing strategies for future laser weeding systems, by examining the impacts of farm/farmer characteristics, knowledge and attitudes towards precision agriculture, and external factors on farmers' preferences.

Literature

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