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Assessing the environmental footprint of digital agriculture: research perspectives

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Introduction

- Digital tools for agriculture are one of the levers to accelerate the agroecological transition. However, little is known about the impacts of their use on the environment and how to assess them.
- The progressive adoption of digital agriculture makes its environmental assessment necessary.
- Three review of the environmental impacts of digital agriculture have already been published, but the methods used to assess these impacts remain poorly understood.
- This study aims at establishing a state-of-the-art of the digital tools evaluated and evaluation methods used. The methodological challenges of assessing the environmental impacts of these tools will be highlighted.



Method: a systematic review











Query execution



On Web of Science and Scopus databases



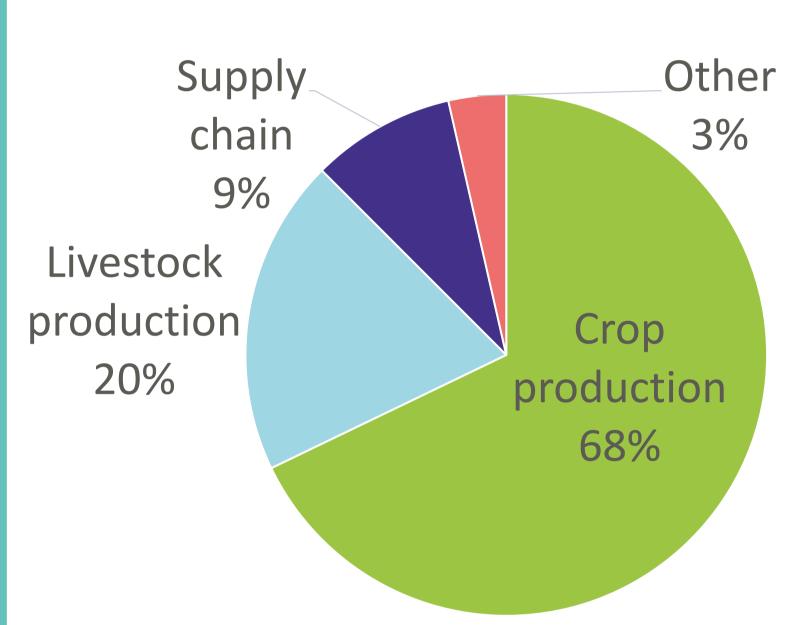
PRISMA method applied with Rayyan software



General statement

9%

Out of the 56 papers reviewed...



... A majority deals with crop production while digital tools for livestock production and supply chain are poorly assessed.

... Most of them are used Logistics to manage agricultural inputs. Other functions were identified like time savings and animal welfare.

Other 14%

Agricultural inputs management 77%

Of Life Cycle Assessment (LCA)

LCA is the environmental assessment method used by half of the papers. It is a standardised method to quantify the environmental impacts of a tool or a product. It is a multicriteria and life-cycle based analysis.

LCA methodological challenges

By LCA steps, from the 28 LCA studies

Goal and Scope

The functional unit must represent the function of the digital tool.

The system boundaries should include both life cycle impacts of the digital tool and impacts from the introduction of the tool in the agricultural system.

Interpretation



Uncertainties are often high because data come from

> various sources and some of them are

approximated. The **numerous**

LCA indicators make it difficult to rank scenarios.

In-site impacts related to the stakeholders territory are not taken into account in the

Life cycle inventory

Data about digital tools for agriculture may lack due to their emerging use and the recent concern about their environmental footprint.

3

Environmental impacts assessment



V-

All the environmental indicators of the impact assessment method should be presented. Digitalisation has negative consequences on indicators like mineral resource consumption, while agricultural practices impacts water use, ecotoxicity...

results

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To date, the studies assessing the environmental impacts of digital tools for agriculture focused on input management in crop production. Further research must be carried out to have a better insight into the environmental footprint of digital agriculture in all its forms. Furthermore, guidelines must be provided in order to consider the specificities of digital agriculture in environmental assessment, such as consistent system boundaries and helpful indicators for stakeholders.







