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Choosing the functional unit of an emerging technology: the case of digital tools in agriculture

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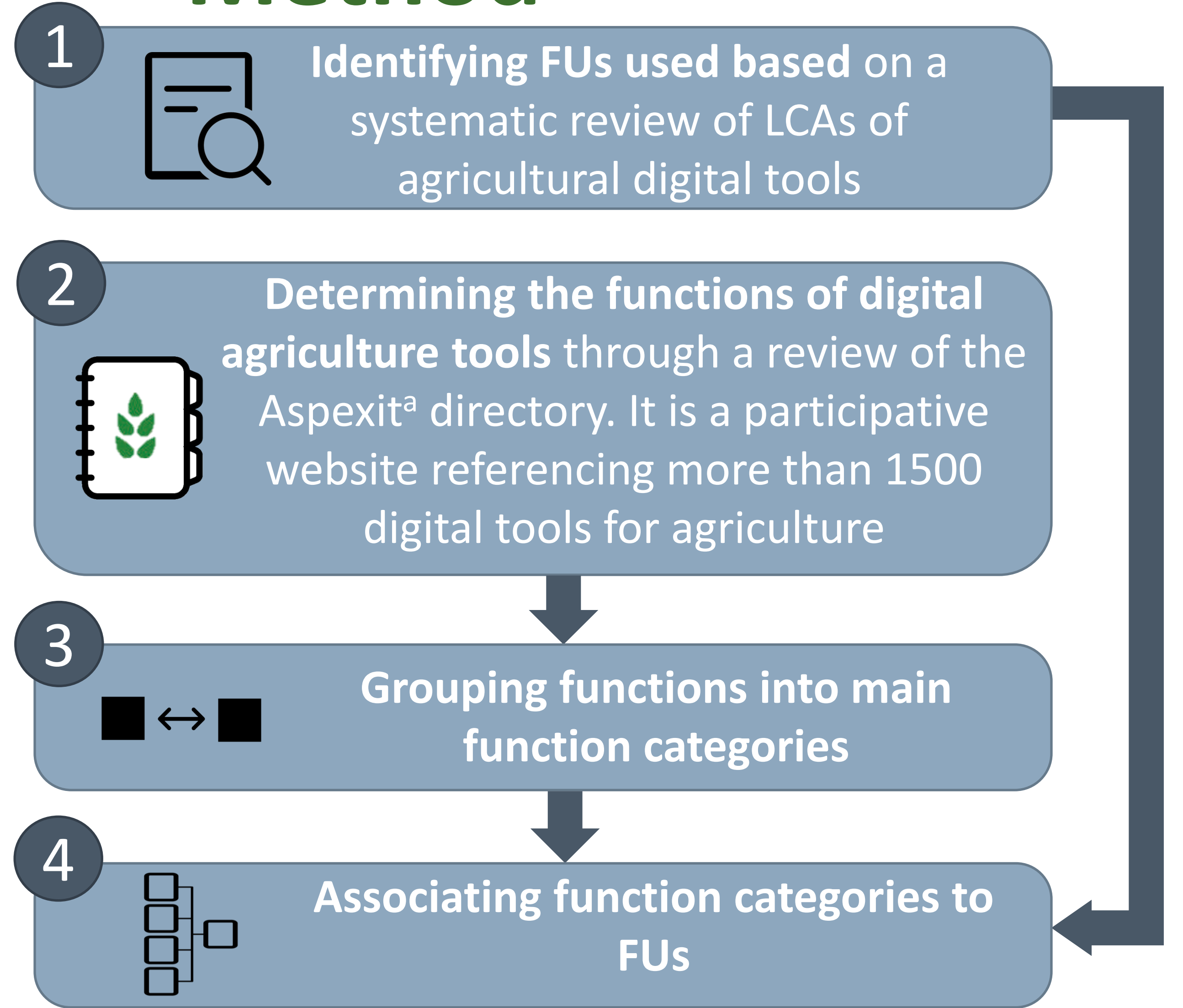
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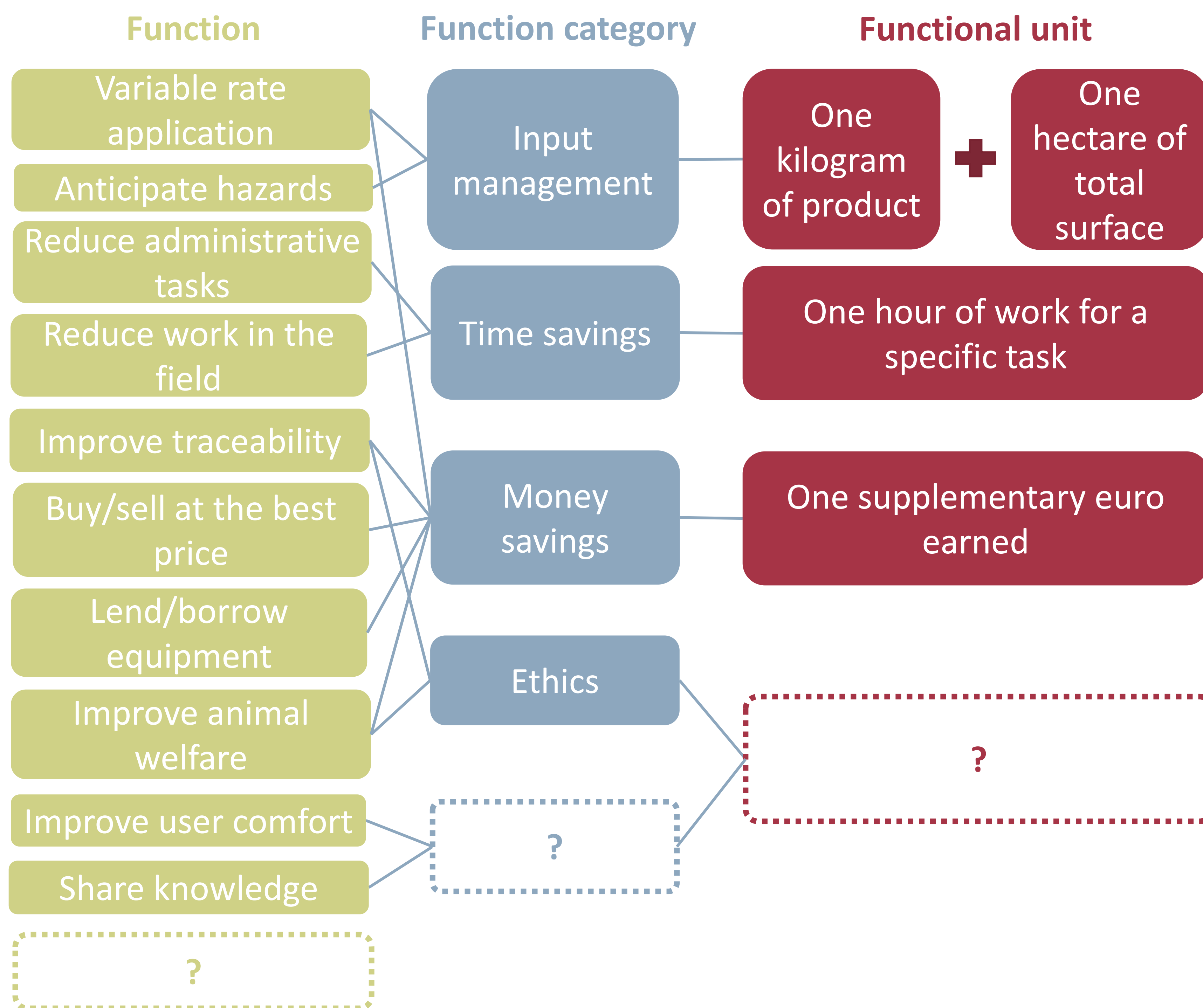
Introduction

- **Digital tools for agriculture** are one of the levers to accelerate the **agroecological transition**. However, their environmental impacts remain unclear and must therefore be assessed.
- These **emerging** tools are **multifunctional** and can lead to **new uses**. These specificities raise methodological issues in the **goal and scope phase** of **Prospective Life-Cycle Assessment** (PLCA) approach.
- Therefore, this work focuses on identifying **the functions** of digital tools in agriculture. Several classifications of these tools exist but they are based on their place in the data chain or on the technology used. **A new classification** is required to choose a proper FU in adequation with the function of the tool.
- This study aims at proposing a functional classification and **objectifying the choice of the FU** for PLCA of agricultural digital tools.

Method



Results & discussion



- The **input management** function category encompasses tools from precision agriculture. They are related to a **mass-based FU** because they lead to **productivity gains**. A **surface-based FU** should be added as a proxy of the **ecosystemic services** provided by agricultural practices.
- **Time and money savings** functions may be associated with specific FUs, **hours and euros saved**. However, these FUs raise issues for comparative LCAs as they do not represent the function of the baseline scenario without digital tool, questioning the choice of the **reference system**.
- **Money savings** can be related to **all other function categories**. Therefore, a money-based functional unit could be an FU for all function categories.
- All the functions may not have been identified yet. As emerging technologies, digital tools are believed to have **unknown future uses**.
- Some functions are intangible thus **difficult to quantify**. They have been not associated with any FUs yet.
- **Multifunctionality** of digital tools remains a challenge when defining FU

Take-home message

Identifying a **proper functional unit** is crucial when applying PLCA to agricultural digital tools given their **multifunctional** and **emerging use**. Through a **decision tree**, the choice of the FU can be based on a rational process. This framework improves **accuracy and relevancy** of environmental assessment of digital tools in agriculture.

a : <https://www.lesoutilsnumeriquesdesagriculteurs.com/>