

Systematic review of serious games on livestock and how they consider sustainability

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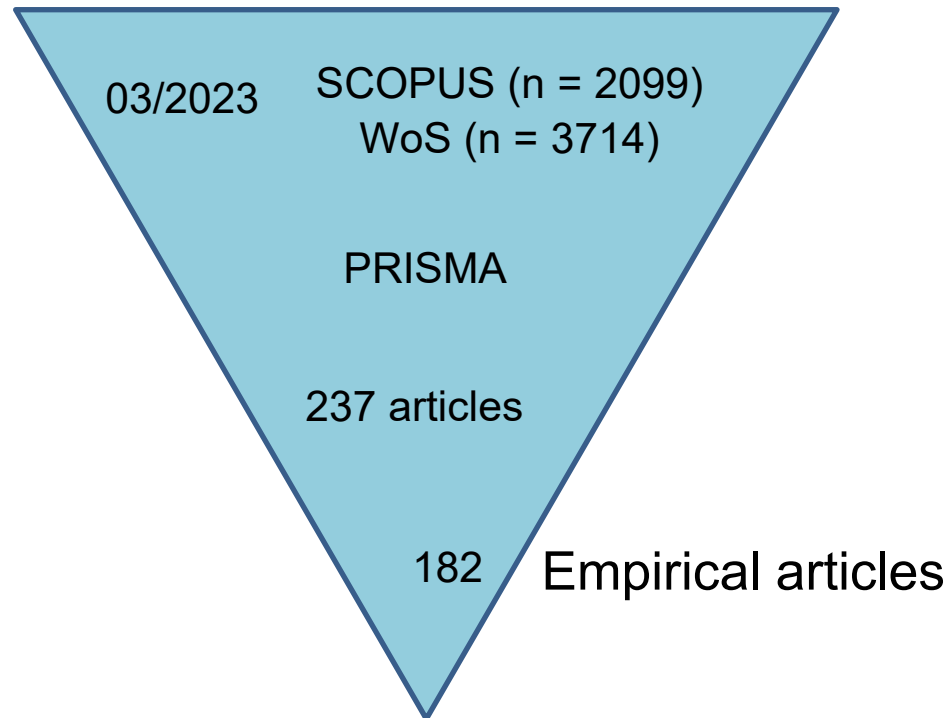
Serious game and agricultural transitions

- Transitions are necessary but systemic:
 - Several dimensions at stake: agriculture, environment...
 - Variety of spatial scales: plot, local landscape...
 - Variety of organizational levels: farm, agricultural sector, communal, ...
 - Diversity of paths: agroecology, biotechnology...
 - Games are useful tools to tackle systemic problems
 - But hard to perceive the diversity of existing games
- => Lets explore this diversity !

Methodology : review

Agriculture / Livestock except
forestry, game breeding, fisheries

- **Equation** : **game** x **agriculture** on title / abstract / keywords



Game characteristics

- Unreal situation (but realistic)
- Taking decisions
- Dynamics based on rules
- Uncertainty of winning
- Limited consequences

Brougère, 2005



Descriptive statistics

Frameworks mobilised

Evaluation of game effects

New World Kirkpatrick Model, adapted by Etienne *et al* (2023) :

- Level 1 = Feeling about the game session
- Level 2 = Knowledge and learnings
- Level 3 = Mindset changes
- Level 4 = Real changes in operations

Sustainability from Velten et al. 2015

Goals of the game

Overarching goals	Environnemental goals	Social goals	Economic goals
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Strategies the player can use

Adaptative management	Coopération	Ecology-based strategy	Economics-based strategy	Holistic & Complex system thinking	Knowledge & Science	Subsidiarity
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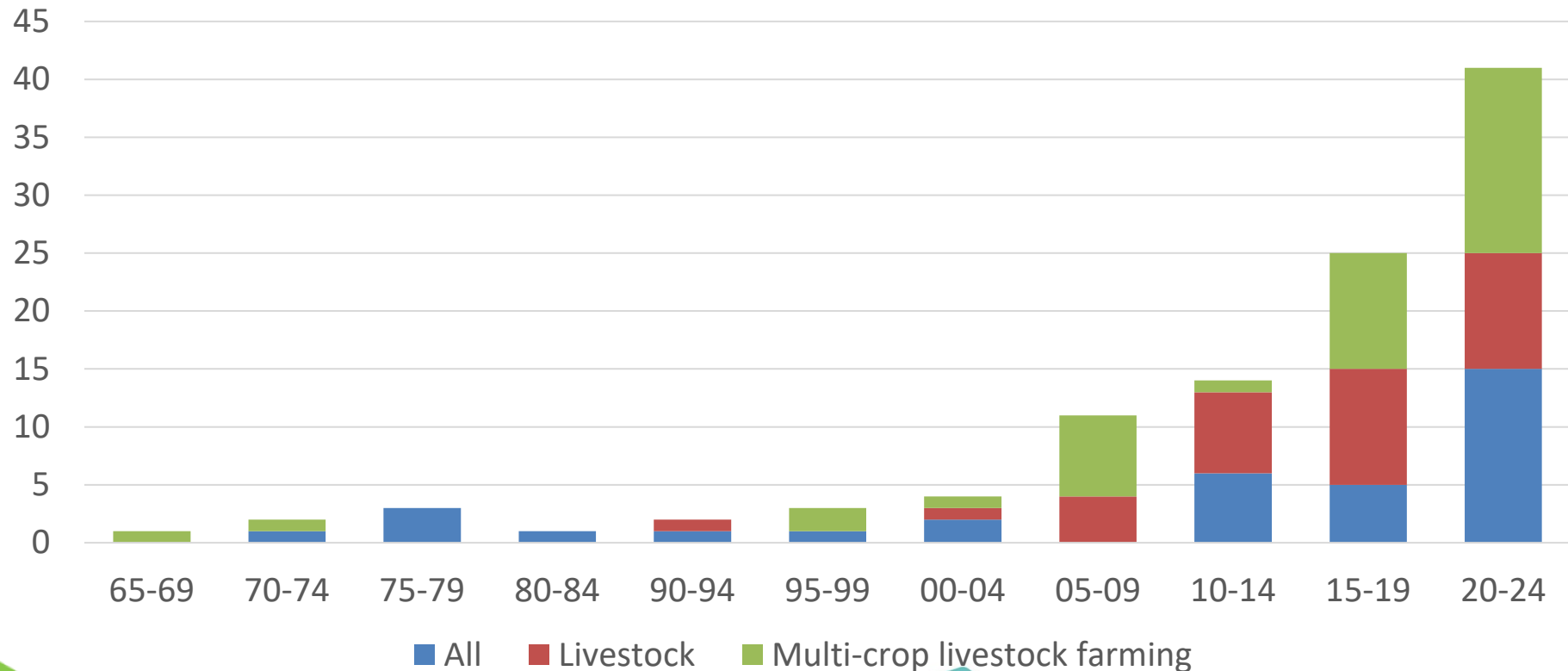
Actions the player can do

Agrifood system	Management & Technological solutions	Social & Environmental challenges	Social & Human capital	Social, Political et Economic Environment
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A explosion of articles on games in the last decade

- 107 articles on the 182 can include livestock farming
- First article published in 1968 (Curtis, The use of a business game for teaching farm business analysis to high school and adult students)

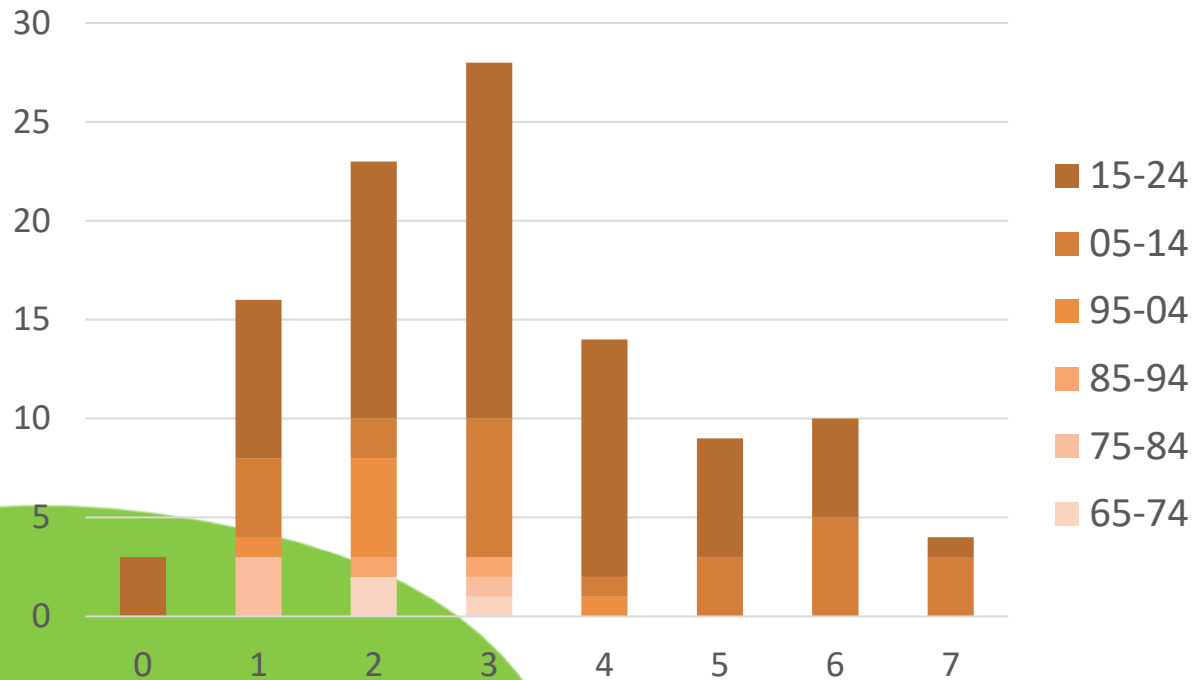
Articles on games with livestock per 5 years periods



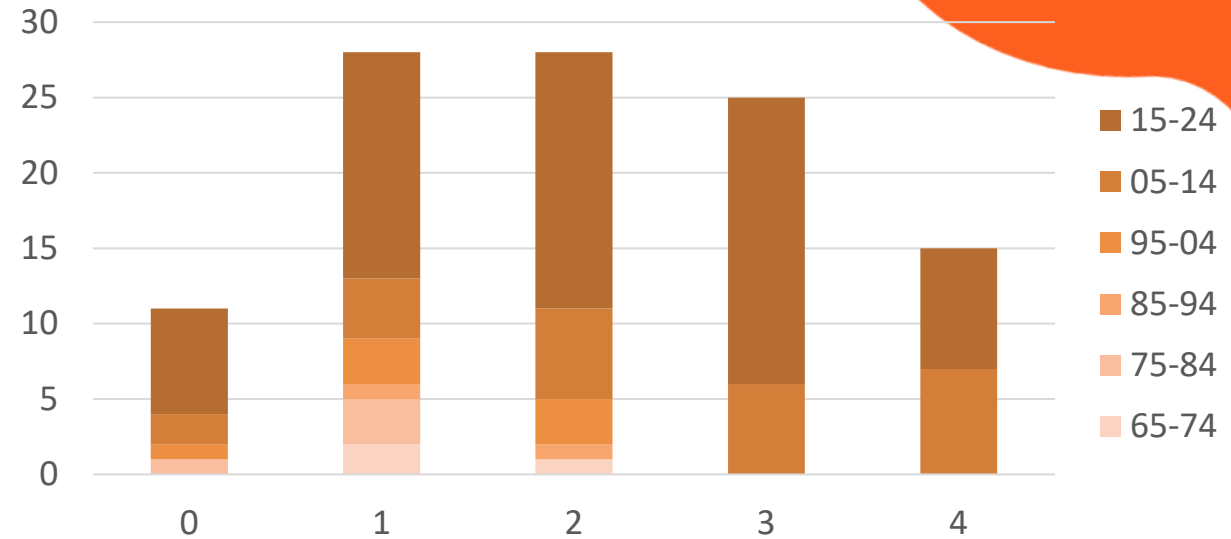
Sustainability in games with livestock

- Games tackle multiple goals especially Environment and Economy
- Increase number of strategies and field of action available in games

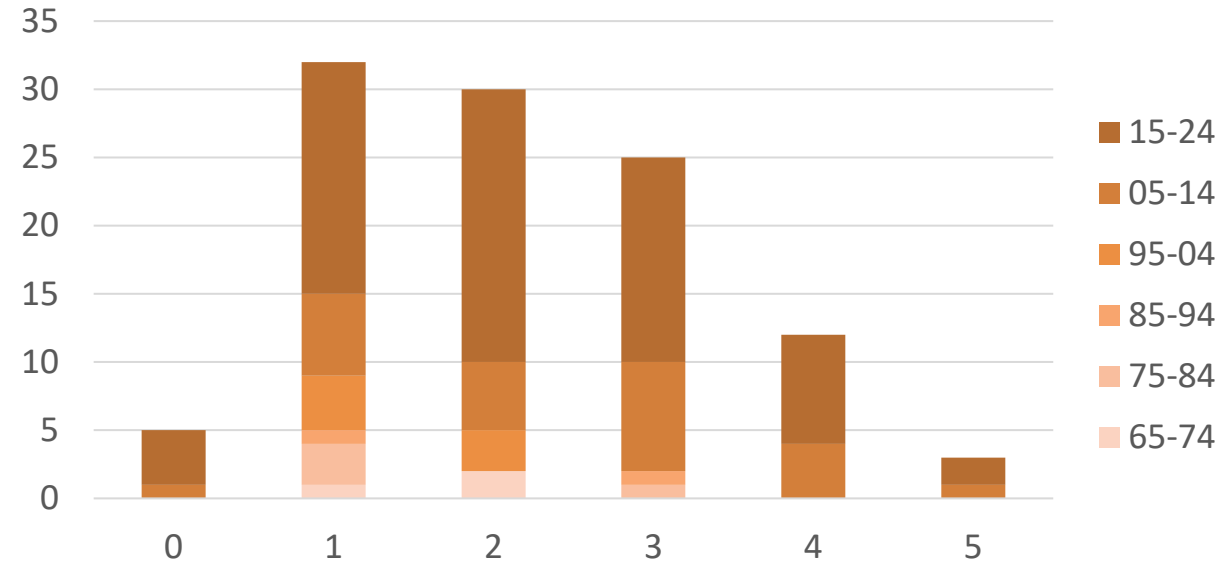
Number of games according to the number of strategies and year



Number of games according to the number of goals and year



Number of games according to the number of fields of action and year



Diving in explicit livestock games

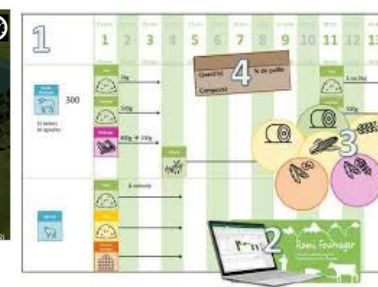
- 39 articles describe the way they represent the animal / herd / livestock farm management
- We analyse for these games
 - Field of livestock farming represented (economy, reproduction, feeding, health and welfare, effluent)
 - Objective (Learning, Mediation, Research and data collect, Co-design)
 - Players (Farmers, Students, workers in agricultural sector, Citizens...)
 - Sustainability

Fields of animal science

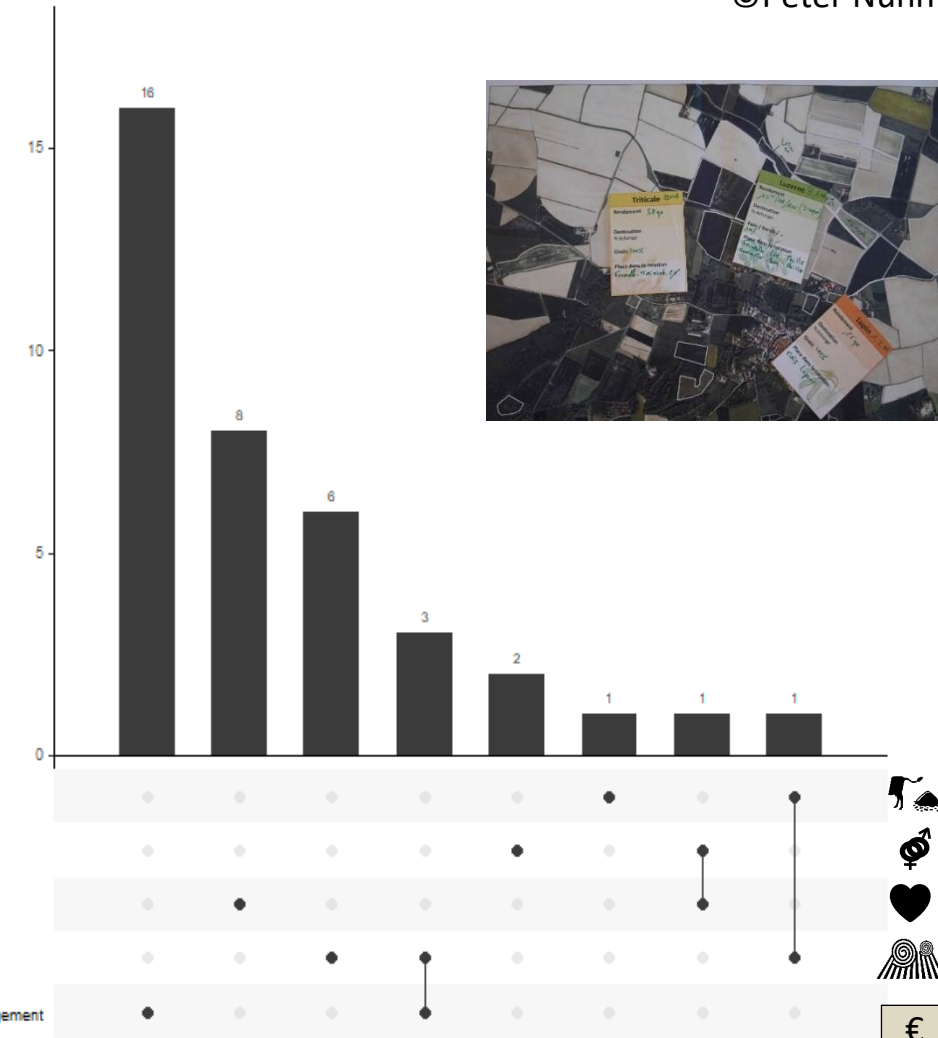
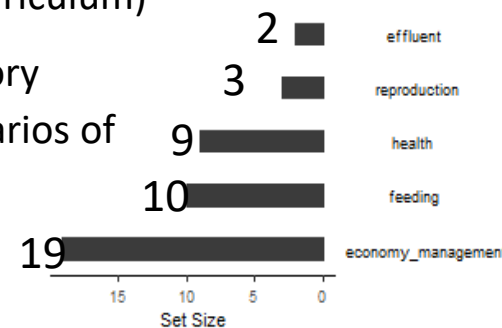
Economy and management of livestock farms are at the heart of livestock games with half of studies (i.e. Gómez-Prada et al. 2020. Strategy for the appropriation of a dss in small bovine producers using simulation and a serious video game)

Feeding (10 games, ie. Martin et al., 2011, Forage rummy: A game to support the participatory design of adapted livestock systems) and Health (9 games, ie. Hawkins et al., 2019. The development and evaluation of 'farm animal welfare': An educational computer game for children) are well represented

Reproduction (3 games, i.e. Baillie et al., 2005, Integrating a Bovine Rectal Palpation Simulator into an Undergraduate Veterinary Curriculum) and effluent (2 games, Ryschawy et al., 2022. A participatory approach based on the serious game Dynamix to co-design scenarios of crop-livestock integration among farms) are rare.



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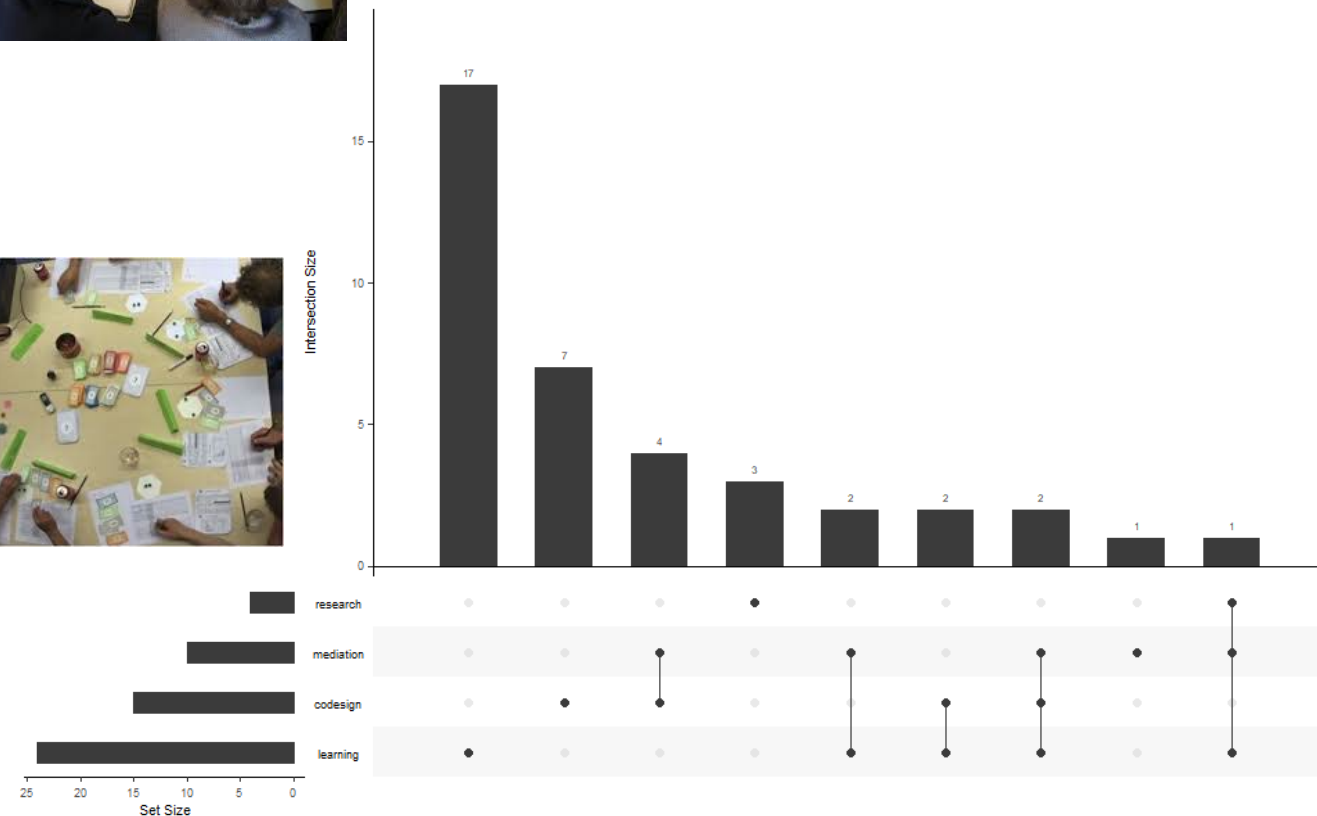
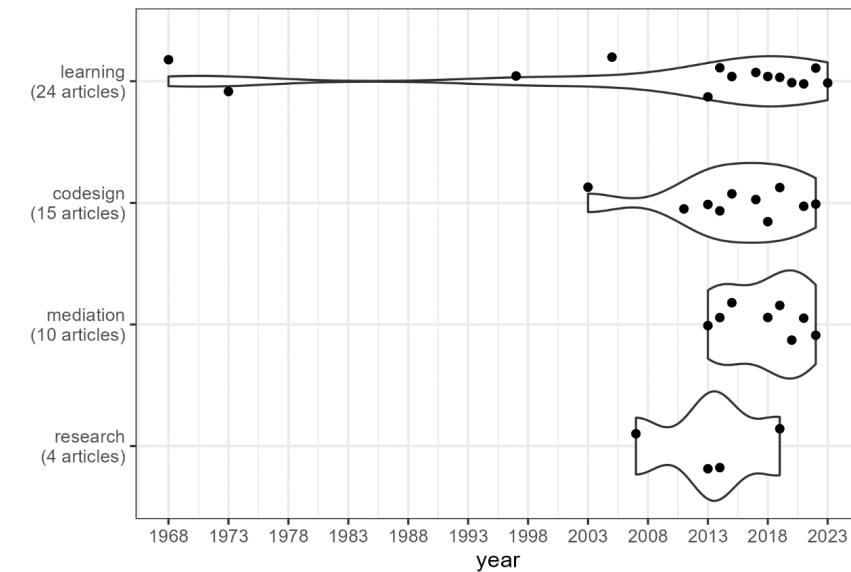
Objectives

First objective and still important in new games is learning, which is often the only one objective of the game (Klit et al. 2018. A prospective cohort study of game-based learning by digital simulation of a pig farm to train agriculture students to reduce piglet mortality)

Second is co-design, both alone or with another objective (Etienne et al., 2003. SYLVOPAST: a multiple target role-playing game to assess negotiation processes in sylvopastoral management planning)

Mediation is quite frequent but rarely the main objective (Benard & de Cock Buning, 2013. Exploring the potential of Dutch pig farmers and urban-citizens to learn through frame reflection).

Games to collect data for research purpose are rare (Ambrosius et al., 2019. The social influence of investment decisions: A game about the Dutch pork sector)

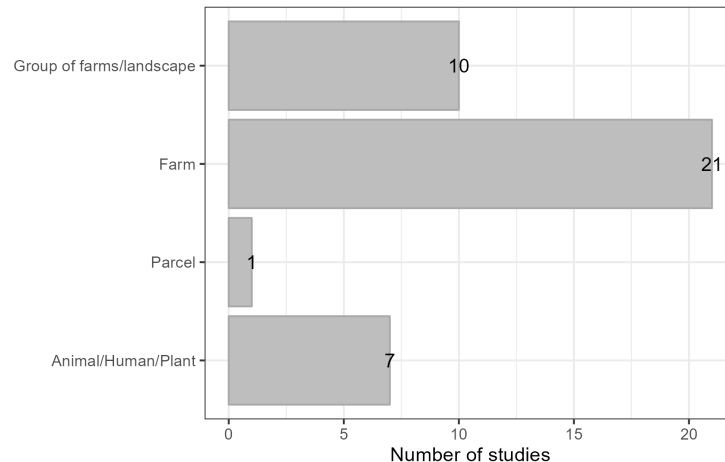
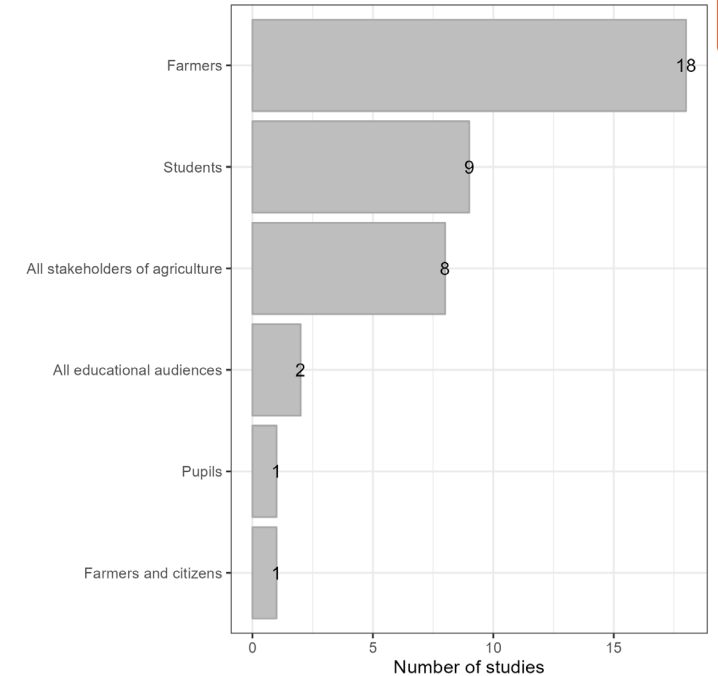


Players and scales implemented in games

Link to the objective, main players aimed by games are Farmers and students

Beyond the farmers, ¼ of games aimed to be played by the diversity of stakeholders of agriculture

Few games presented in the scientific literature aimed at citizens or pupils



Livestock games represent the farm level mainly

Landscape is well represented too as the animal it self.

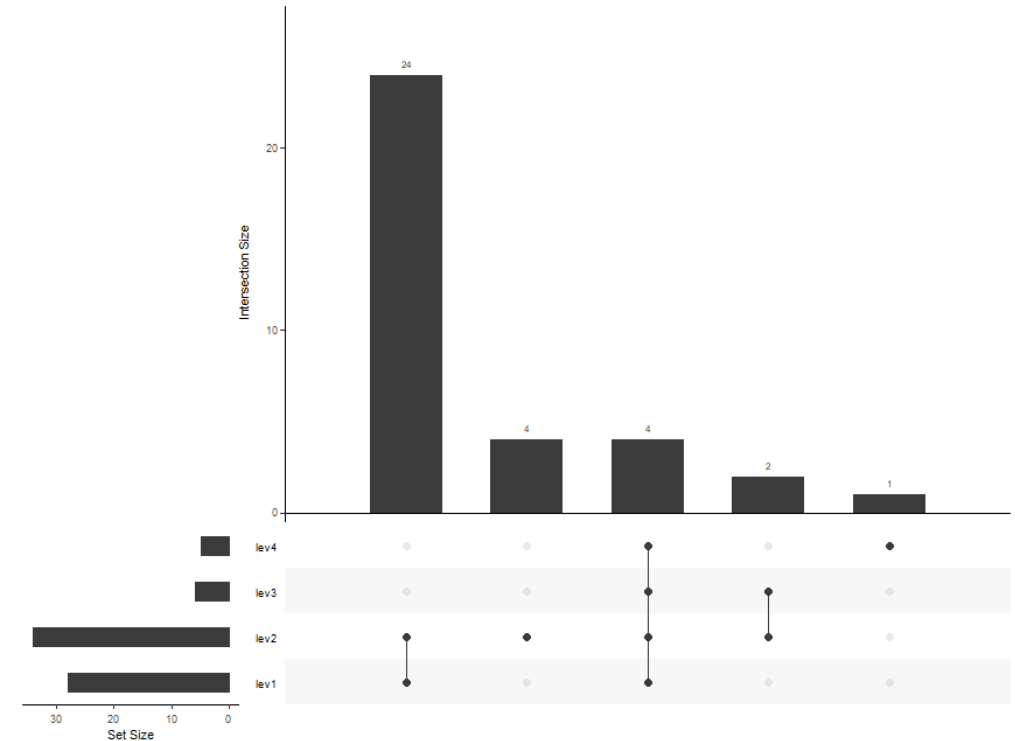
Evaluation of game effects

4 games did not present an evaluation process in the article

28 looked at the Feelings and Learnings levels

2 added the Mindset level

5 articles presented the way they evaluate the effects of the game on the player practice after the game session



Conclusions

- A low number of articles that describe the livestock representation in the game
- Games on Health and Welfare, and on Reproduction are less represented
 - Do we need to focus on specific mechanism to improve sustainability ?

Games are more conceived for learning purposes despite an interest of this method to collect data. Need to:

- Explore the technical literature to discover more games and more witnesses of their use
- Identify what are the models promoted by those games

Livestock games are available to explore all the dimensions of sustainability

- Still a question on their “in real life” effect evaluation

Thank you for your attention



A game session next year ?

In the time interval :
explore gamae.fr

Martel et al., EAAP 2024, 1-5 Sept 2024, Firenze, Italy

