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Diffusion of flood damage: an application to wine sector

David Nortes Martínez¹, Pauline Brémond¹, Stefano Farolfi², Frédéric Grelot¹, Juliette Rouchier³

The Study

AIM OF THE STUDY

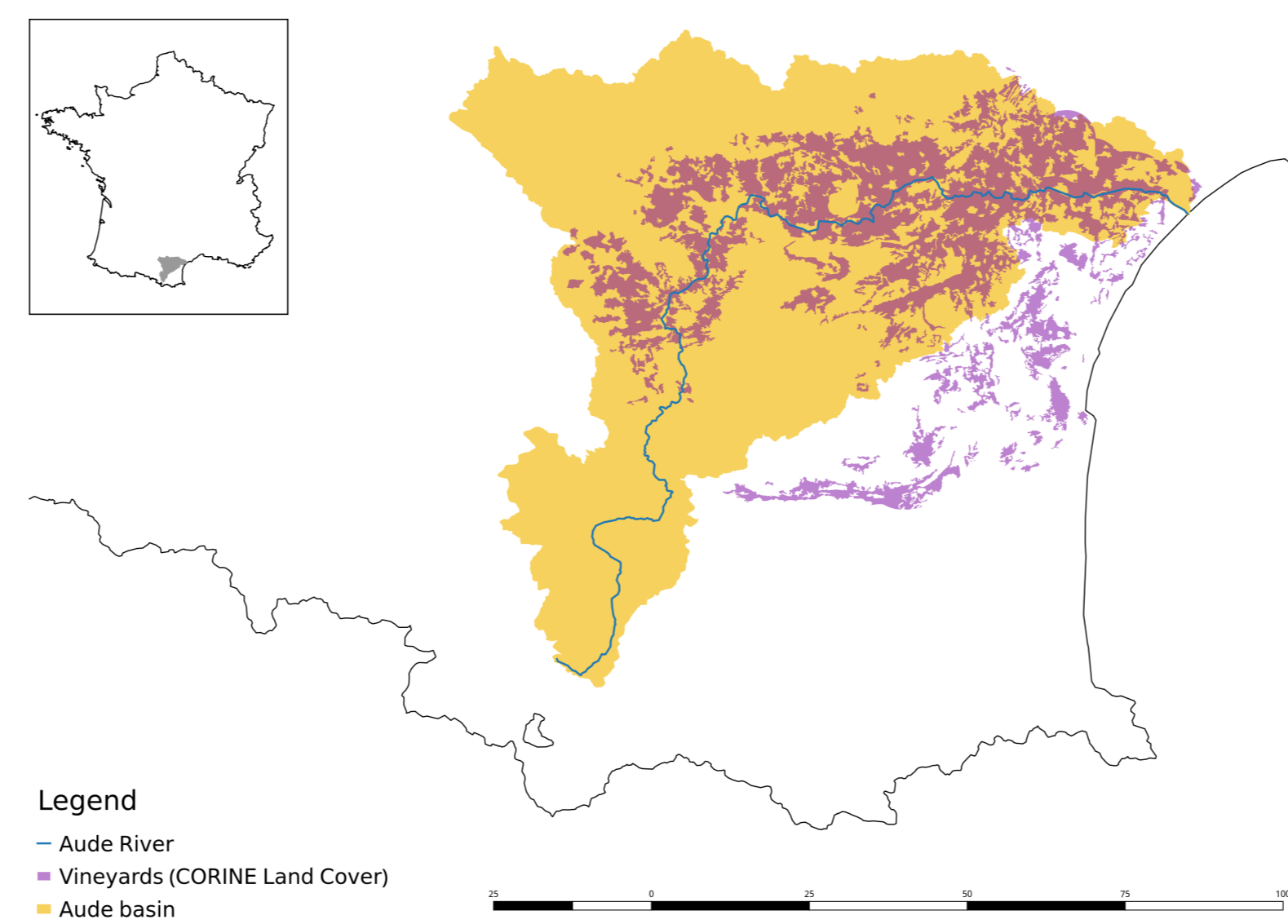
Understanding of indirect effects of hazards and its propagation along economic networks is essential to improve current cost-benefit analysis methodologies.

1. How direct impacts of floods over an agent can affect other agents in the same network?
2. Are effects of floods persistent over time?

METHODOLOGY

Empirically based Agent-based models.
Surveys to understand the framework, networks, constraints and rationalities.

Case study: Aude department



Model

1. Agents and environment

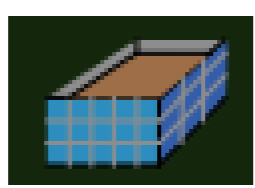
AGENTS

1. Farmers.



- Own croplands and grow grapes.
- Support the cooperative winery costs.
- Revenue comes from wine sold by the cooperative.

2. Cooperatives.

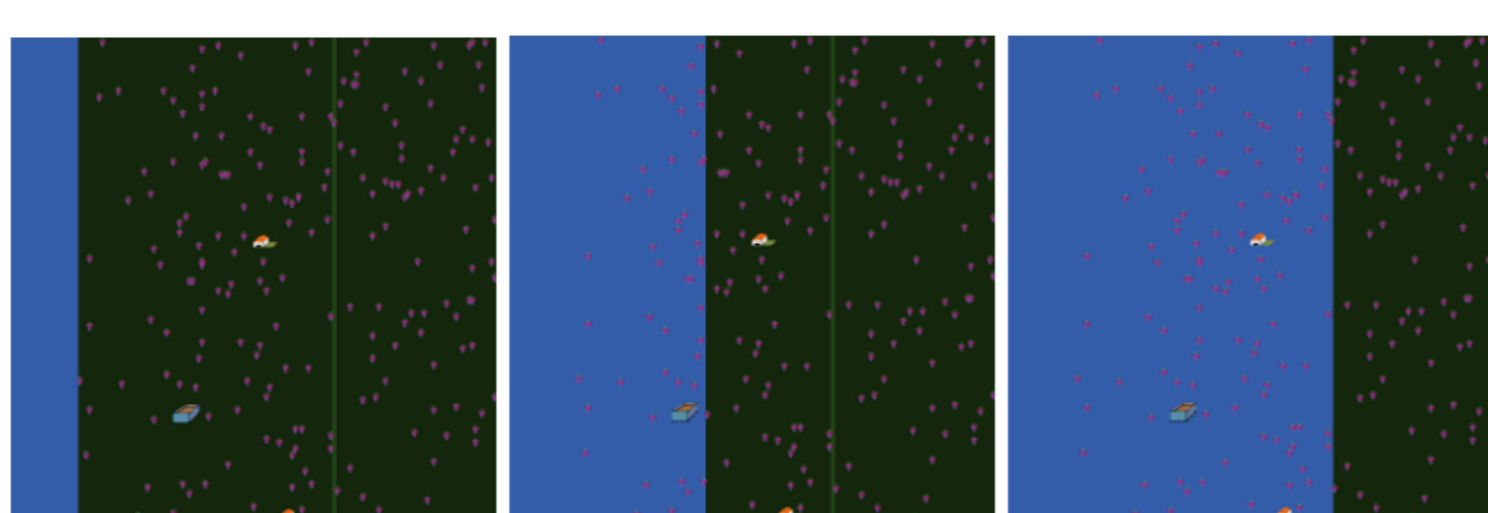


- Receive the grapes, process the wine and sell it in the markets.
- Costs and revenues distributed proportionally to yearly yield.

ENVIRONMENT



SIMULATIONS



1. Exogenous Prices.

2. Farm homogeneous in number of croplands but not in risk of being flooded

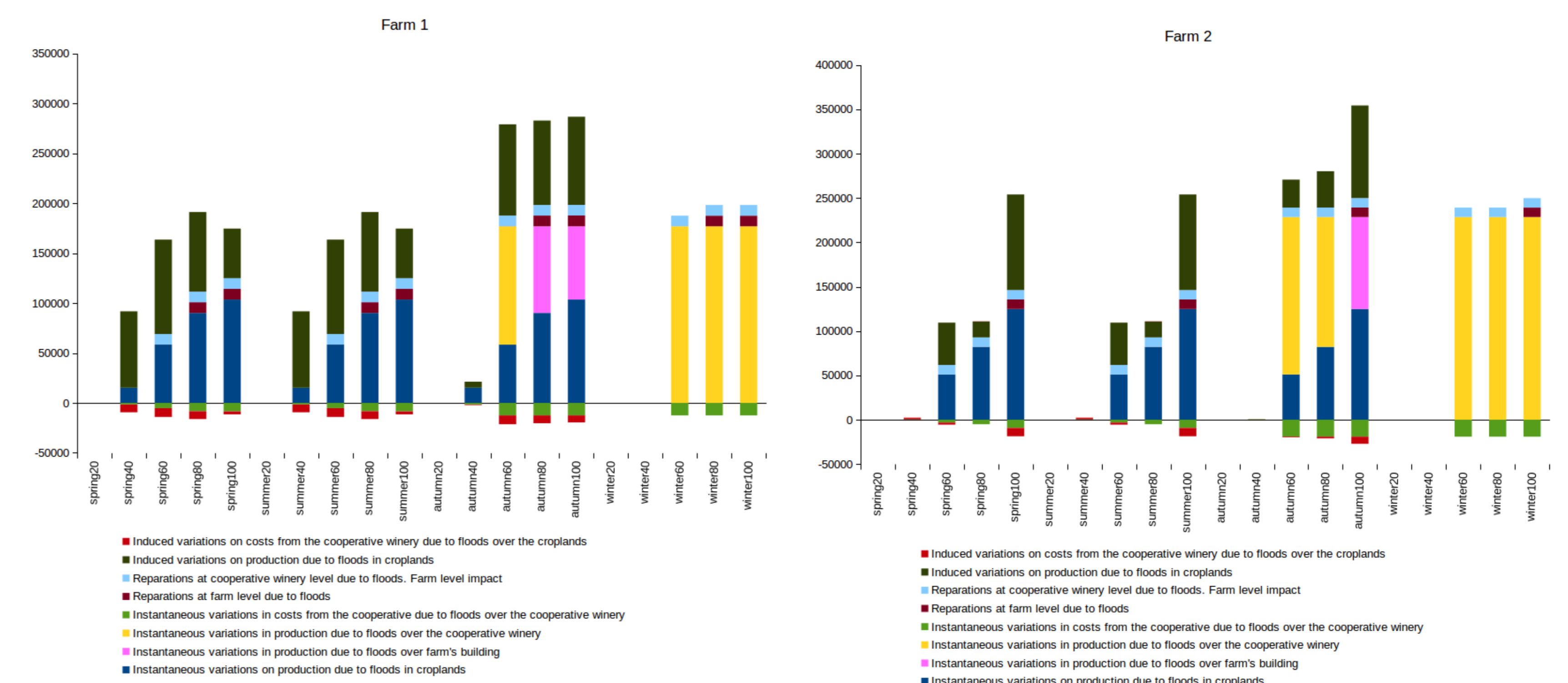
3. Different flood extents (as % of the prone area). Impacts on different elements:

- 20%: nothing.
- 40%: Farm 1's croplands.
- 60%: Farm 1 and 2's croplands + cooperative.
- 80%: Farm 1 and 2's croplands + cooperative + Farm 1.
- 100%: Everything excepts croplands outside prone area.

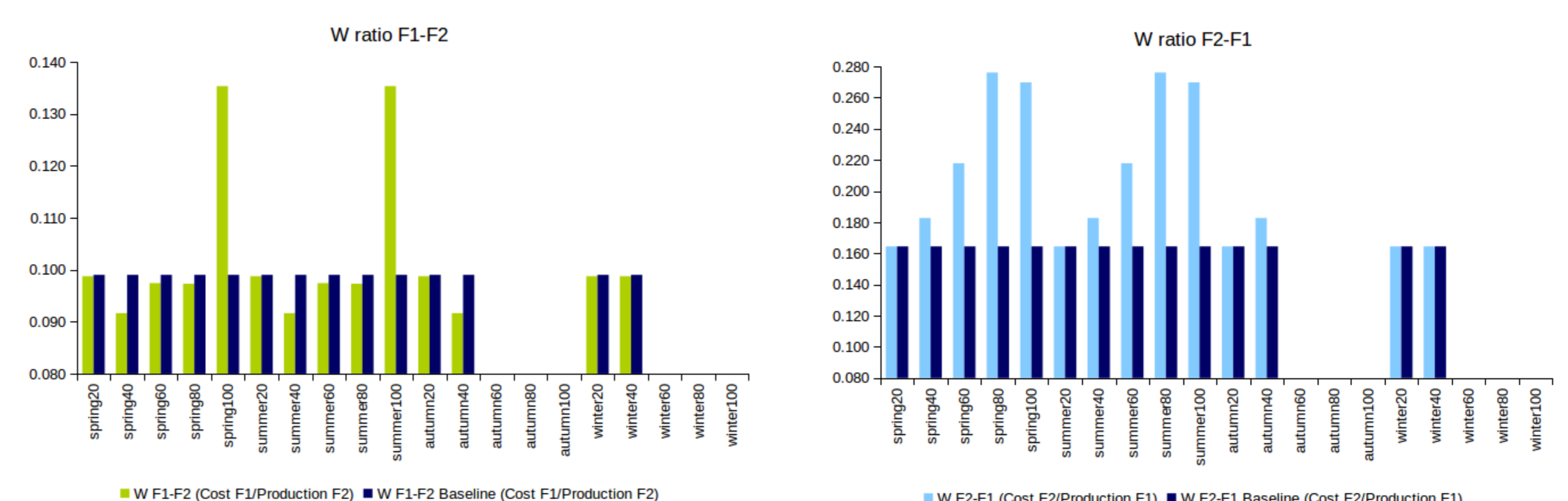
4. Simulations for every season.

2. Outputs

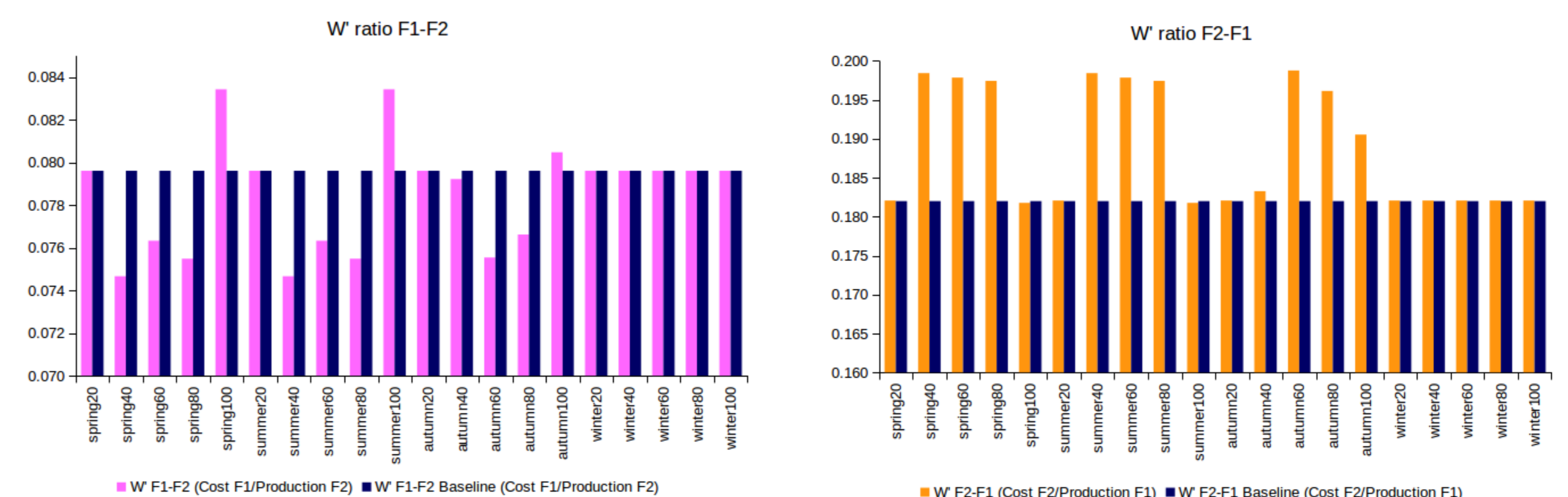
COSTS DECOMPOSITION CHARTS: Sources and assessment of damages (€).



CROSSED EFFECTS RATIO CHARTS: Euros (€) spent by an agent per Euros (€) of revenue received by another one.



INDUCED CROSSED EFFECTS RATIO CHARTS: mid-term crossed effects ratio.



3. Conclusions

- Amount and sources of damage depend on seasons and magnitude of the flood.
- Persistent mid-term effects \Rightarrow Mid-term induced costs.
- Because of interaction and economic links, damages over one agent affect other ones in the system, even if they have not been flooded.
- Persistent mid-term crossed effects.

Next Steps

- Analysis of long-term effects.
- Effects of floods on soil conditions, market prices...
- Introduction of individual autonomous choice.
- Solidarity mechanisms in floods and their influence.
- Role of insurance.
- Generalization to more sectors.