Simulating the leverage points for the upscaling of innovative organic agri-food systems

Alba Alonso Adame and Siavash Farahbakhsh

alba.alonsoadame@ilvo.vlaanderen.be

www.ilvo.vlaanderen.be

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Universiteit Antwerpen

ILVO
Flanders Research Institute for Agriculture, Fisheries and Food

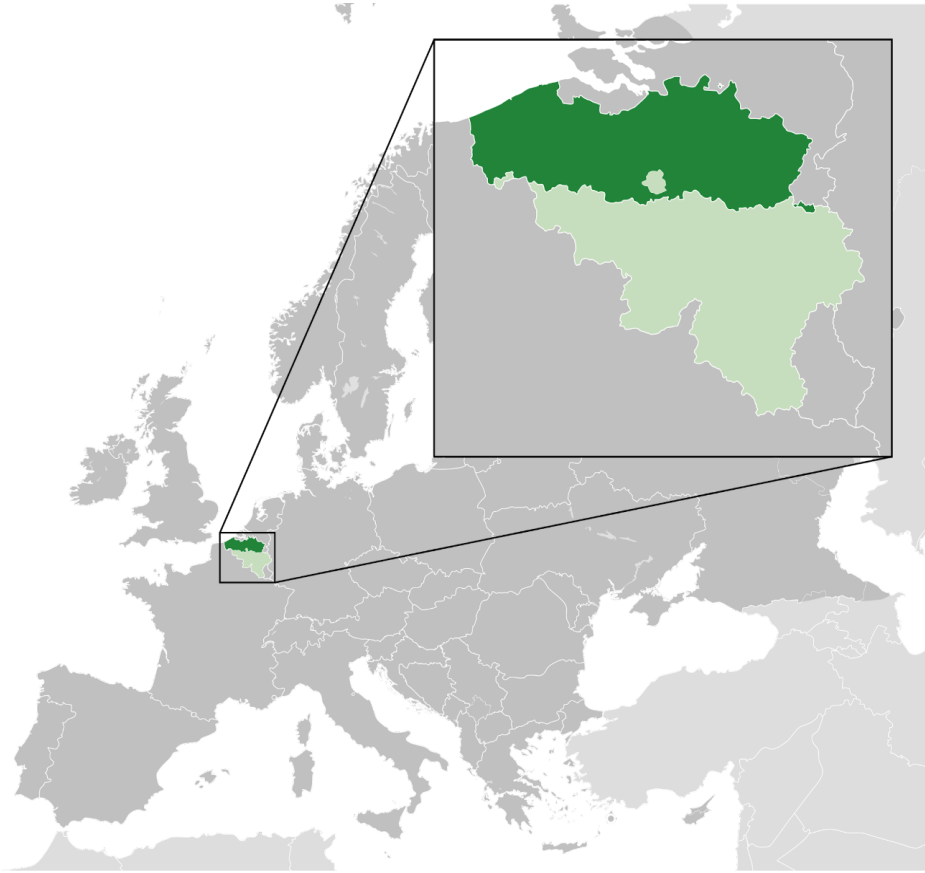
Introduction

- Sustainability and climate change issues Alternatives in agri-food systems
- Agri-food system complex
- Mechanism enabling change
  - Sets of parameters and combinations

RQ: How and when do different mechanisms play a role in horizontal upscaling of innovative and organic agri-food systems resulting in transformation?

Trends in Flanders (Belgium)

- Organic farming increasing by 6% (2020), 3% of total Flemish farms are organic
- In 2020, 593 organic farmers out of 23225.
- Organic area in Flanders: 9124 ha (+ 5% in 2020)
- 49% of organic farms' size is max 5 ha
- Organic farming has lower yields
- Higher price for organic food



Case study

- FOODLEVERS project
- Family farm in West Flanders
- Biologist farmer
- Vegetable crops and sheep for manure
- Organic CSA with self-picking system, the members pay to come to the farm and collect their own food
- In 2017, they start a collaboration together with a nearby hospital's kitchen
- Pioneer agreement, innovative

Agents

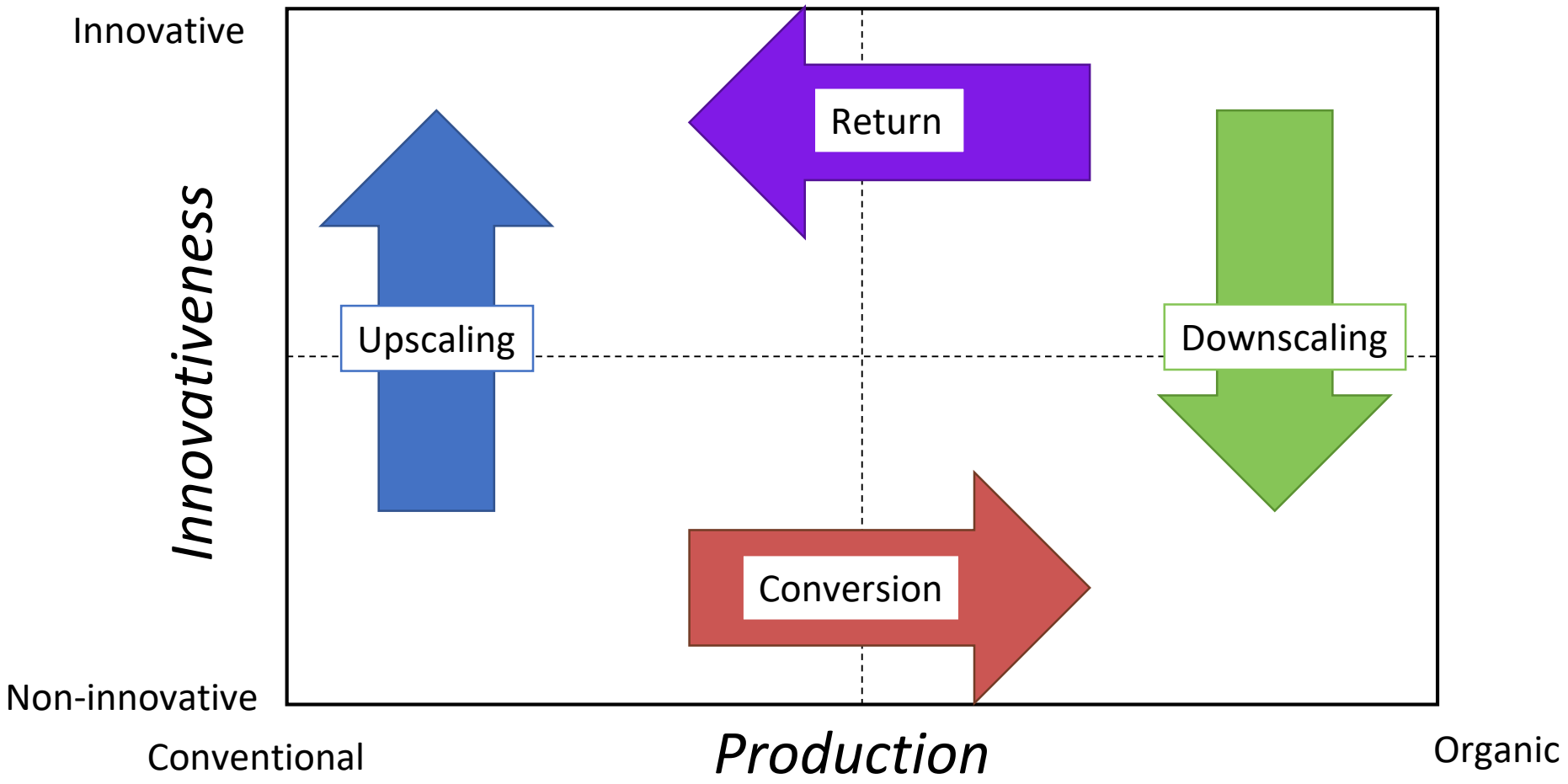
Farmers

- Conventional or organic
- Innovative or non-innovative
- N = 300
- Connected to farmers and consumers

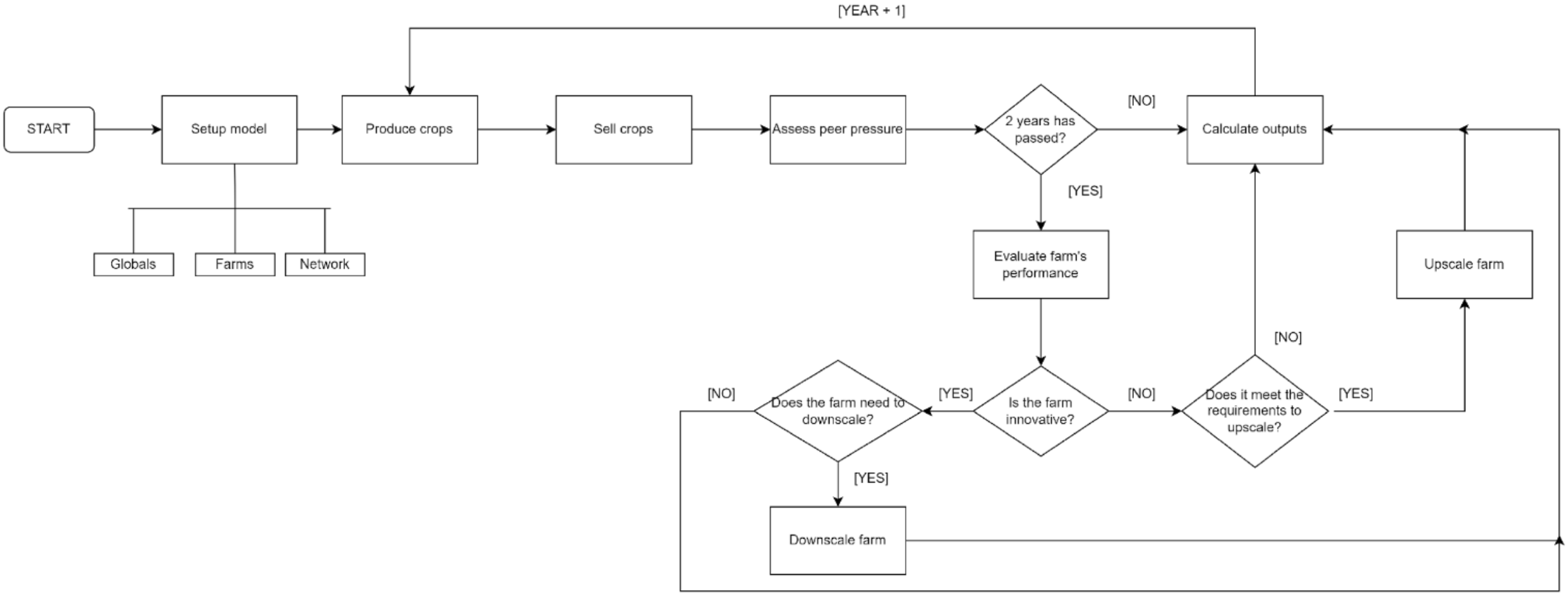
Consumers

- Individual or group
- Organic preference or conventional preference
- N = 85500
- Connected to farmers

Procedures


Innovative
Innovativeness
Non-innovative
Return
Upscaling
Downscaling
Conversion
Conventional
Production
Organic

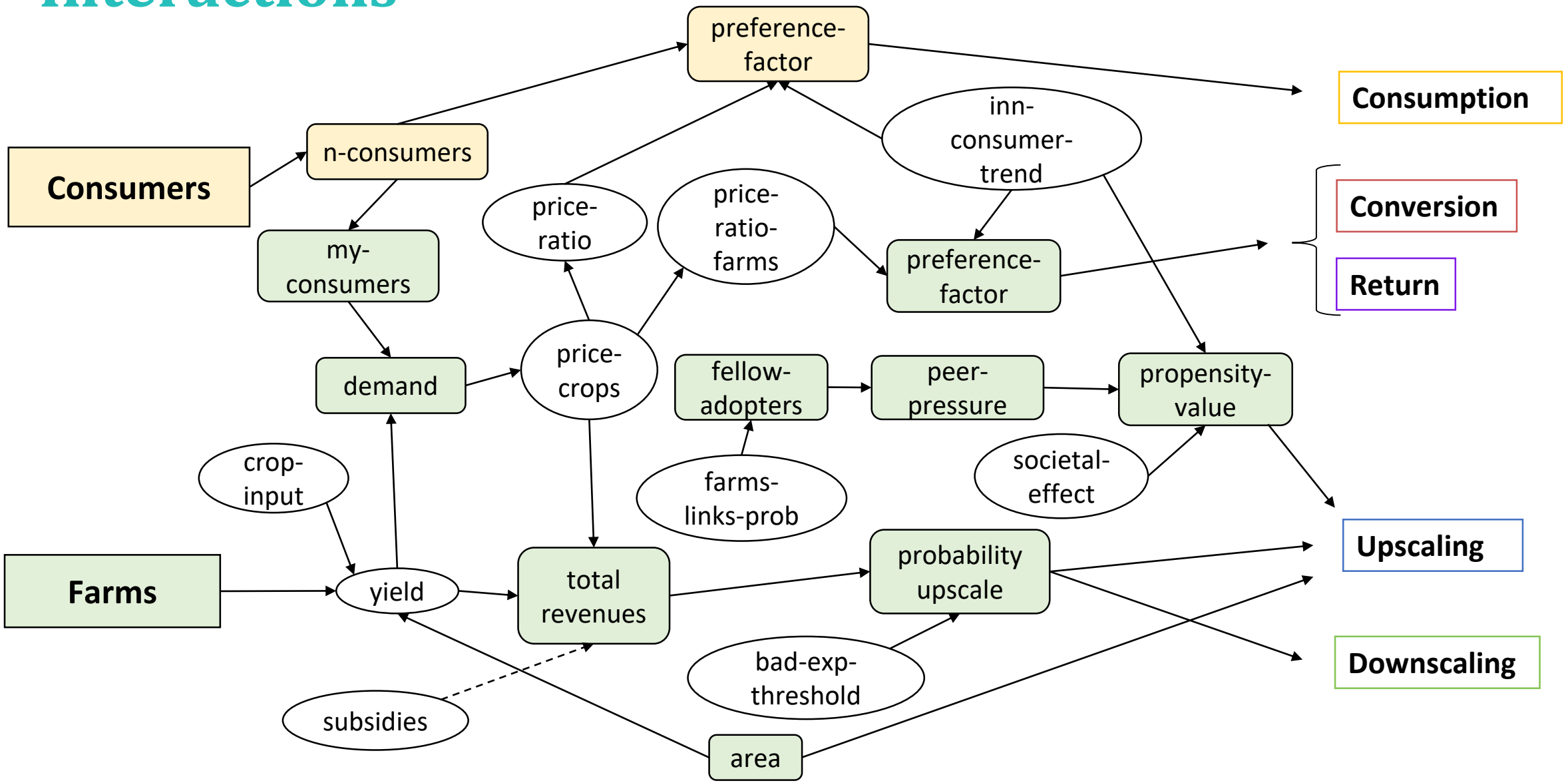
Conceptual model



Parameters

Name	Parameter	Value	Units
Proportion organic innovative farms	*prop-organic-inn*	1	%
Proportion organic non-inn farms	*prop-organic-non-inn*	2	%
Proportion conventional innovative farms	*prop-conventional-inn*	1	%
Proportion conventional non-inn farms	*prop-conventional-non-inn*	96	%
Organic farm size	*farm-size-org*	8	ha
Conventional farm size	*farm-size-conv*	26	ha
Number of farms	*n-farms*	300	n
Input for farming (e.g. seeds, machinery,…)	*crop-input-farm*	2.75	EUR/kg
Large consumers (e.g. public kitchen)	*group-consumers*	50	n
Individual consumers	*other-consumers*	10	n
Mean income of farms	*mean-income*	27600	EUR/year
Mean costs	*mean-costs*	350000	EUR/year

Interactions



Experiments

1. **Baseline scenario: farms' experience**
   - *Inn-consumer-trend*
   - *Farms-links*
   - *Bad-experience-threshold*

2. **Baseline scenario: yield gap**
   - *Inn-consumer-trend*
   - *Farms-links*
   - *Yield-gap*

3. **Baseline scenario vs Climate change scenario**
   - *Inn-consumer-trend*
   - *Farms-links*
   - Weather shock

Preliminary results

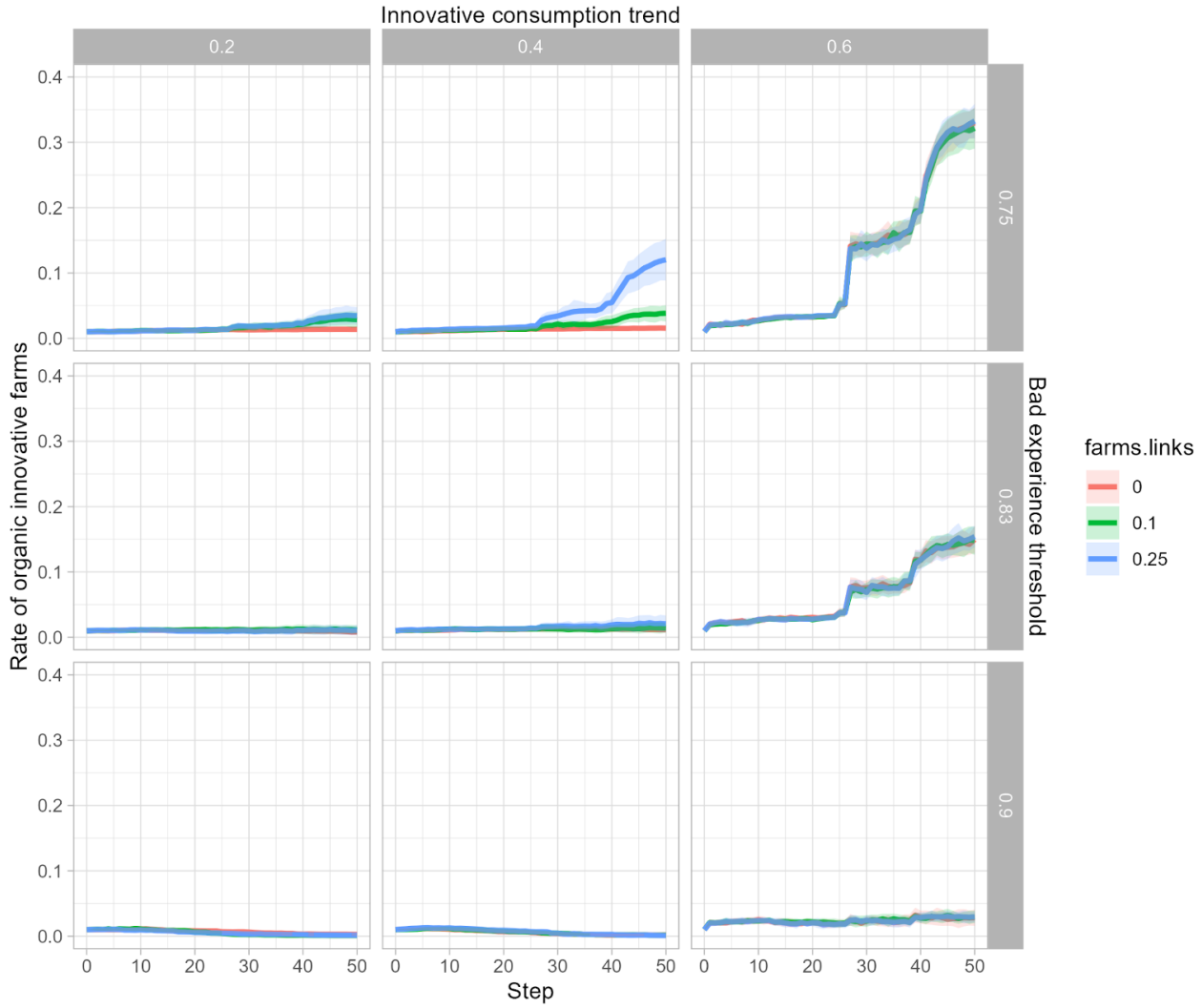


Fig. 1 – Mean rate of organic innovative farms considering innovative consumption trend, bad experience threshold and farms links.

- When innovative consumption trend increases, so does the rate of innovative organic farms
- Bad experience threshold can really affect the rate of innovative organic farms
- Links with other farms have higher effect when innovative consumption trend and bad experience threshold are low

Preliminary results

- When innovative consumption trend increases, so does the rate of innovative organic farms
- Yield gap can slightly affect the rate of innovative organic farms
- Links with other farms have higher effect when innovative consumption trend values are medium and yield gaps are medium to low

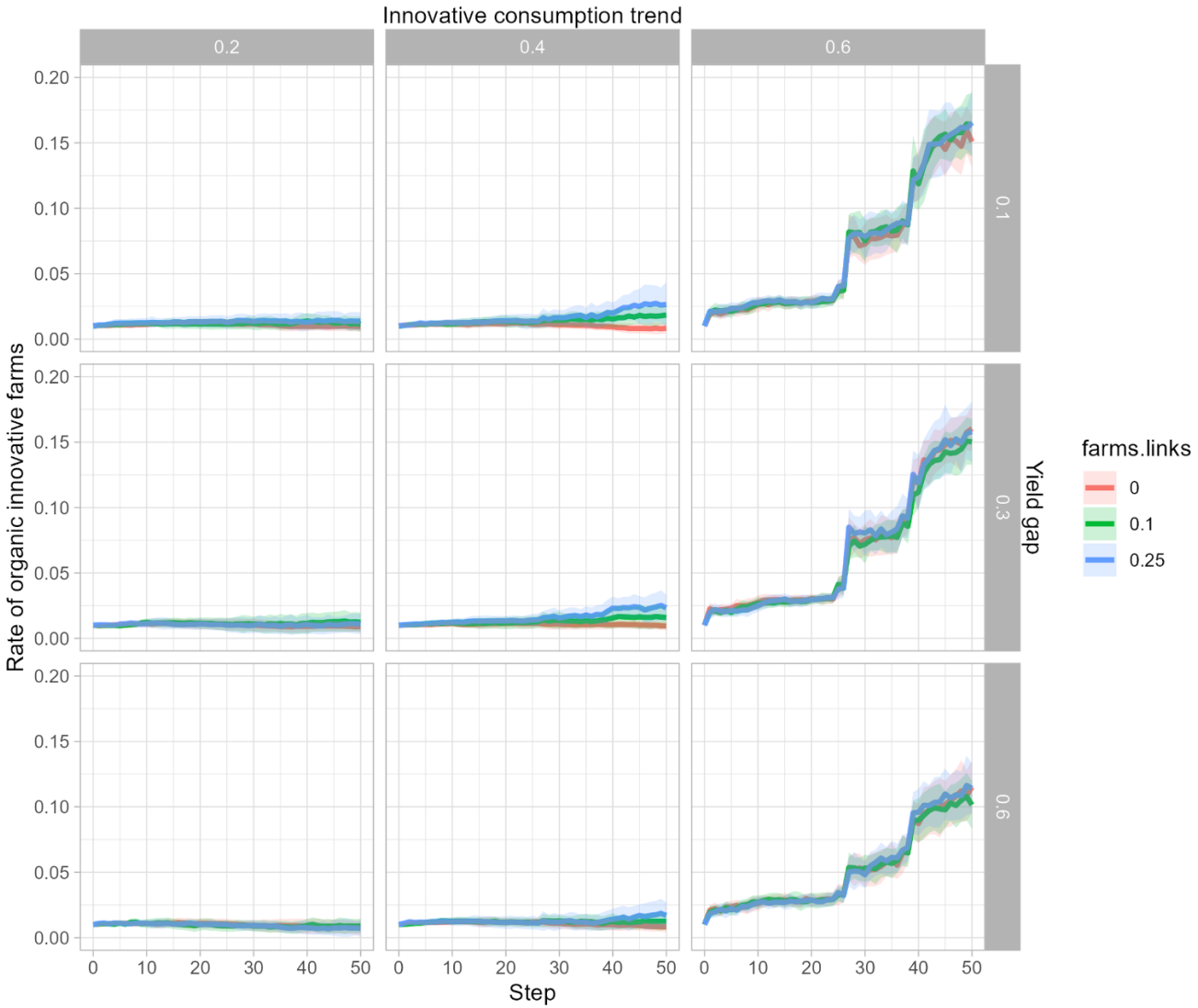


Fig. 2 – Mean rate of organic innovative farms considering innovative consumption trend, yield gap and farms links.

Preliminary results

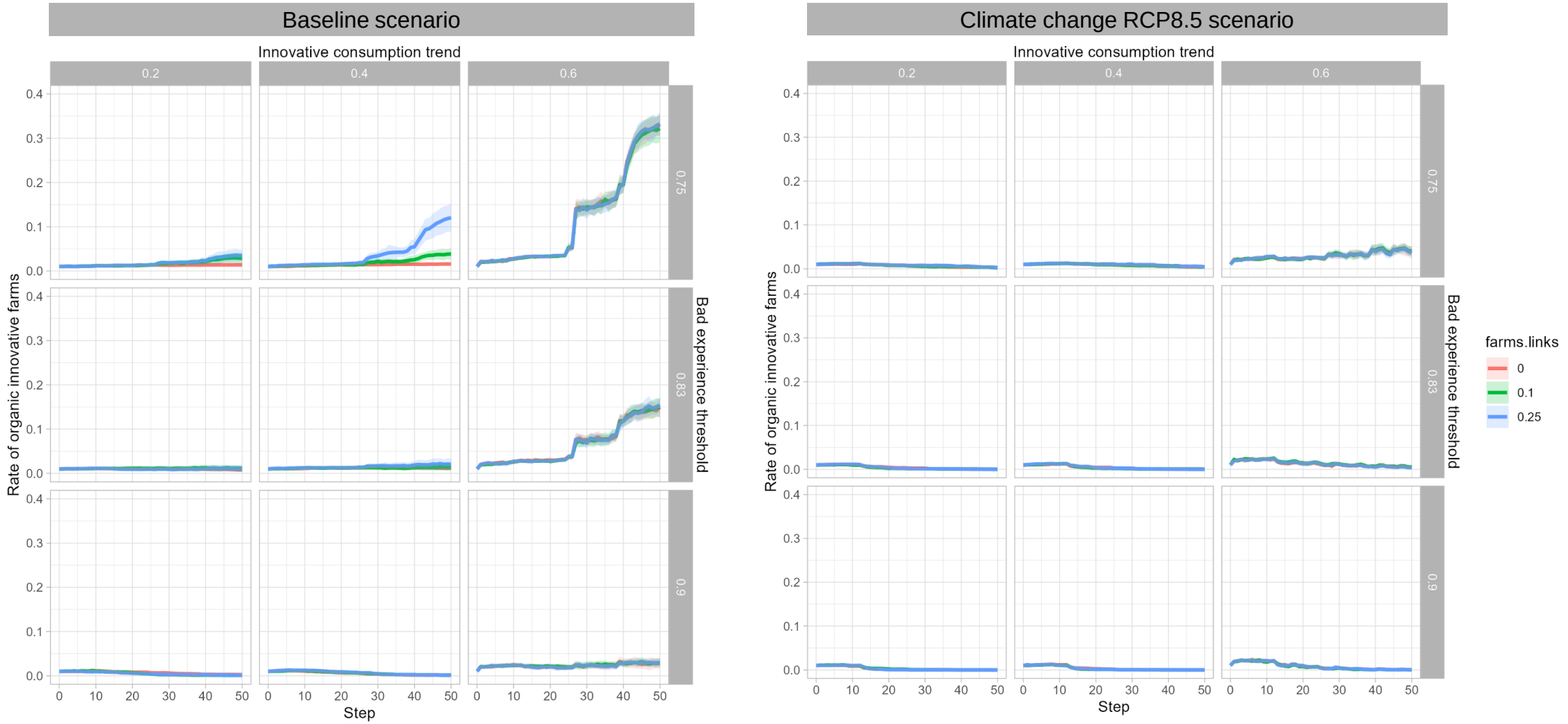


Fig. 3 – Comparison of mean rate of organic innovative farms considering innovative consumption trend, bad experience threshold and farms links in two scenarios: baseline and climate change RCP8.5.

Conclusions

- Innovative consumption trend, bad experience threshold, and farms' links seem to have influence leading to a leverage point for sustainability transitions under certain configurations.
- Yield gap influence farms' decisions towards upscaling to innovative organic when the innovative consumption trend is high enough.
- Expected yield losses that lead to economic losses in regard with climate change may hamper the upscaling to innovative organic.

Further work

- Global sensitivity analysis and more validation with stakeholders
- Calibration with real data How to calibrate the model when data in organic agriculture in Flanders is scarce and we only have one case study?
- Implement improved price dynamics How to implement a better but a simplified price dynamic?
- Integrate socio-ecological dimension to assess sustainability How to couple a socio-ecological submodel to assess the impact of this transition on ecosystem services?

Thank you!

Alba Alonso Adame

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Flanders Research Institute for Agriculture, Fisheries and Food
www.foodlevers.org