

Can “agglomeration payments” induce sustainable management of peat soils in Switzerland?

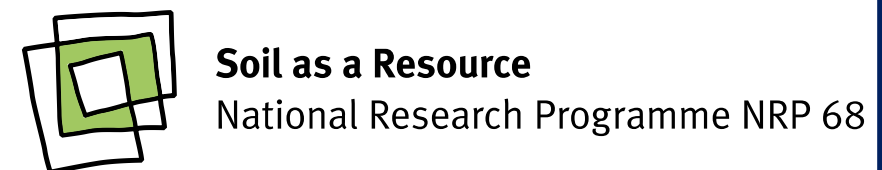
A computerized framed economic experiment

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Peat soils in Switzerland

Intensive soil management practices (drainage), mainly vegetable production (in the «Seeland», CH)



Weakly degraded peat soil

Very degraded peat soil : mineralization and subsidence

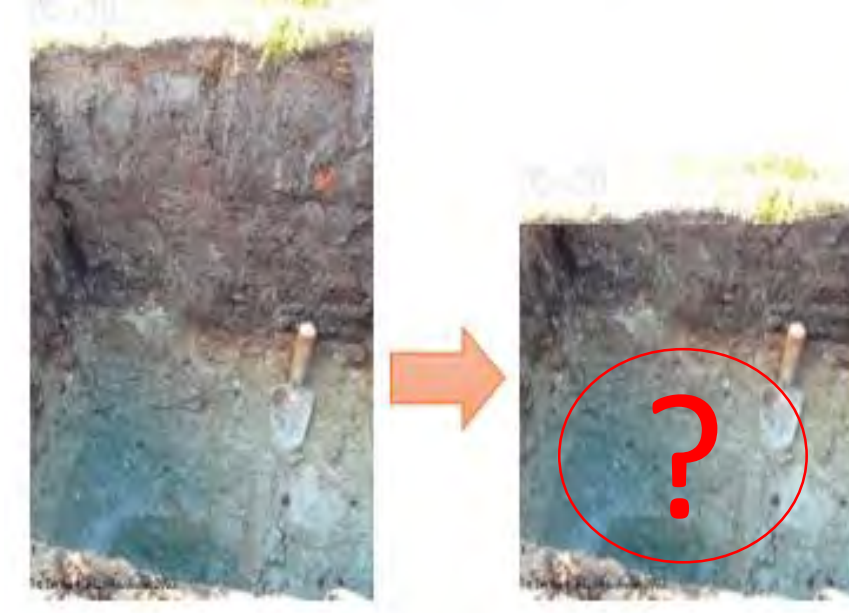
Abstract

Drainage is necessary to enable agricultural activities on peat soils, but this is in conflict with their preservation. We developed a dynamic, computerized, and interactive framed economic experiment to represent the decision situation of Swiss farmers that produce on drained peat soils and conducted it with agricultural students. We compare the effects of two alternative payment schemes on the implementation of a more sustainable peat soil use. We find that a homogeneous payment is most effective in incentivizing farmers to adopt the sustainable land use as compared to a heterogeneous payment. Social preferences are observed as determinant factors in explaining this result.

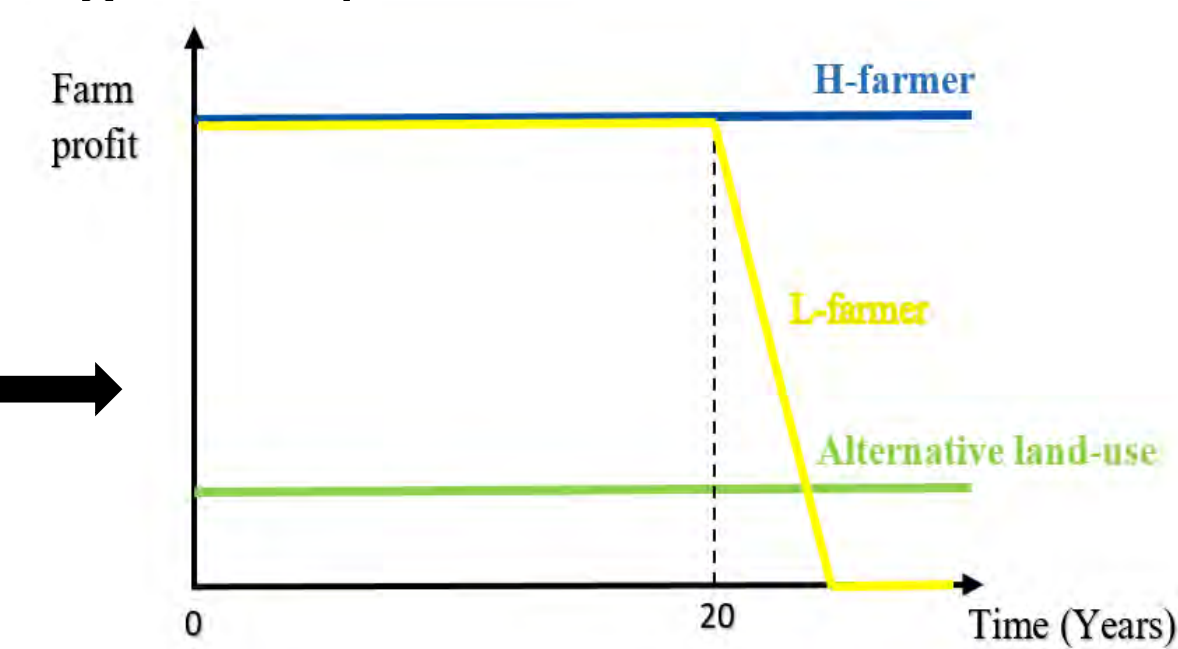
TWO CORE ASPECTS OF THE PROBLEM

1. Pumping station of drainage regulated at a community level.
Cooperation between farmers is needed to change the water table and thus the land use on peat soils.

2. Lack of knowledge about the nature of the underlying mineral layer of peat soils and its suitability for vegetable production:



Peat soil layer reduction, underneath mineral soil layer suitable for vegetable production, or not



Different evolution of farmers' farm profits from vegetable production over time

- High-production potential farmers (**H-farmer**): peat degradation does not affect their future of production and their farm profit;
- Low-production potential farmers (**L-farmers**): reduction of peat layer affects their farm profit.

→ Farmers' opportunity costs from switching land use differ.

Research Questions

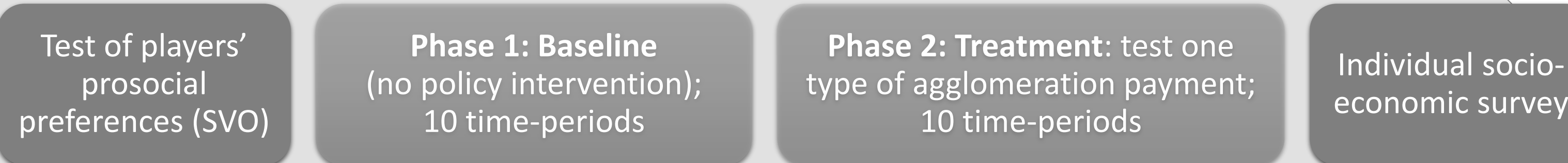
Which payment designs would be most successful in enhancing farmers' cooperation and promoting the adoption of more sustainable peat soil uses?

- Could payments which are only allocated if all farmers in a group jointly undertake the activity (i.e. “agglomeration payments”) be suitable to incentivize farmers' cooperation?
- Should the agglomeration payment be distributed to land users as equal shares, or in accordance with opportunity costs? How does farmers' heterogeneity in opportunity costs for adopting an alternative land use affect their behaviors?
- How do socio-economic and psychological factors influence the results?

METHOD AND EXPERIMENTAL DESIGN

A computerized framed economic experiment simulating decision situations under alternative policies

- Groups of 2 players, heterogeneous in their peat soils.



Structure of the experimental session

- Data collection: agricultural students; some are already farmers.
- Structure of experiment: to capture the essence of the problem and to fit in the literature

At each time-period: players face a trade-off between pursuing vegetable production and adopting a peat-soil-preserving, extensive use that requires rewetting those peat soils.

The procedure is as follows:

1. Communication between group members
2. Option to make a transfer-payment offer (T) to the group member; it is only transferred if the potential beneficiary adopts an extensive peat soil use.
3. Farmers vote in favor or against rewetting peat soils (unanimous decision):
 - If one of them votes against, players continue with vegetable farming; their payoffs are as:

		H-Farmer	
		Pursue vegetable farming on peat soils	
L-Farmer	Pursue vegetable farming on peat soils	800	800
		800	800

- If **both** vote for rewetting, each player needs to make a land use choice on rewetted peat soils: to adopt an extensive land use or to pursue vegetable farming at a cost (25). Their payoffs are then as:

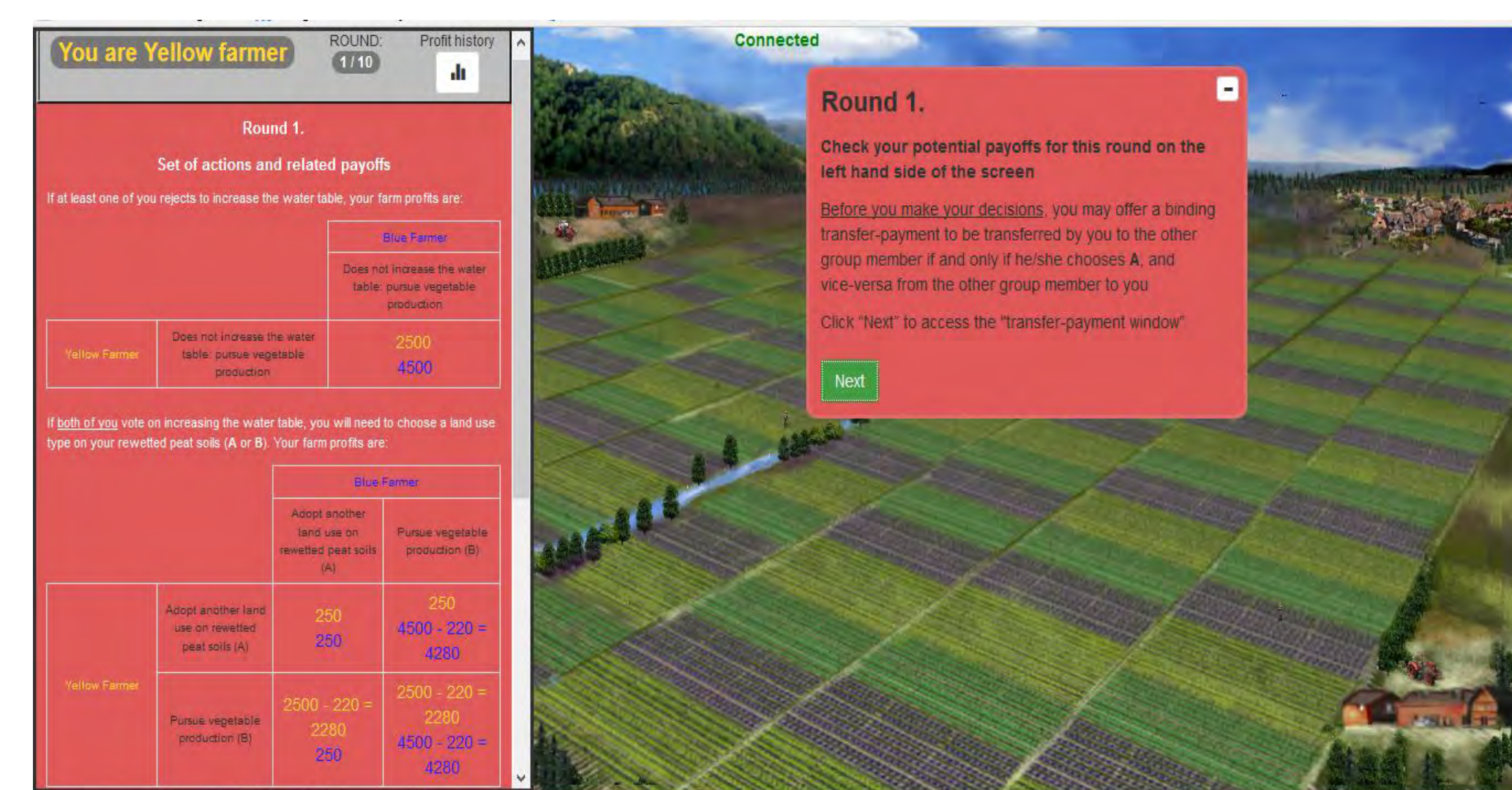
		H-Farmer	
		Adopt an extensive peat soil use	Pursue vegetable farming
L-Farmer	Adopt an extensive peat soil use	$40 + X - T^L + T^H$ $40 + X - T^H + T^L$	$40 + T^H$ $800 - 25 - T^H$
	Pursue vegetable farming	$800 - 25 - T^L$ $40 + T^L$	$800 - 25$ $800 - 25$

T^L (T^H): transfer payment made by L(H) to H(L); Numbers based on actual profit data; X = agglomeration payment.

For L-farmer: farm profit from vegetable production (800) declines as soil gets degraded by vegetable farming. → **Variability of players' incentive over time to adopt an extensive use.**

Treatment 1: X is a homogenous agglomeration payment: equal between both farmers and constant over time.

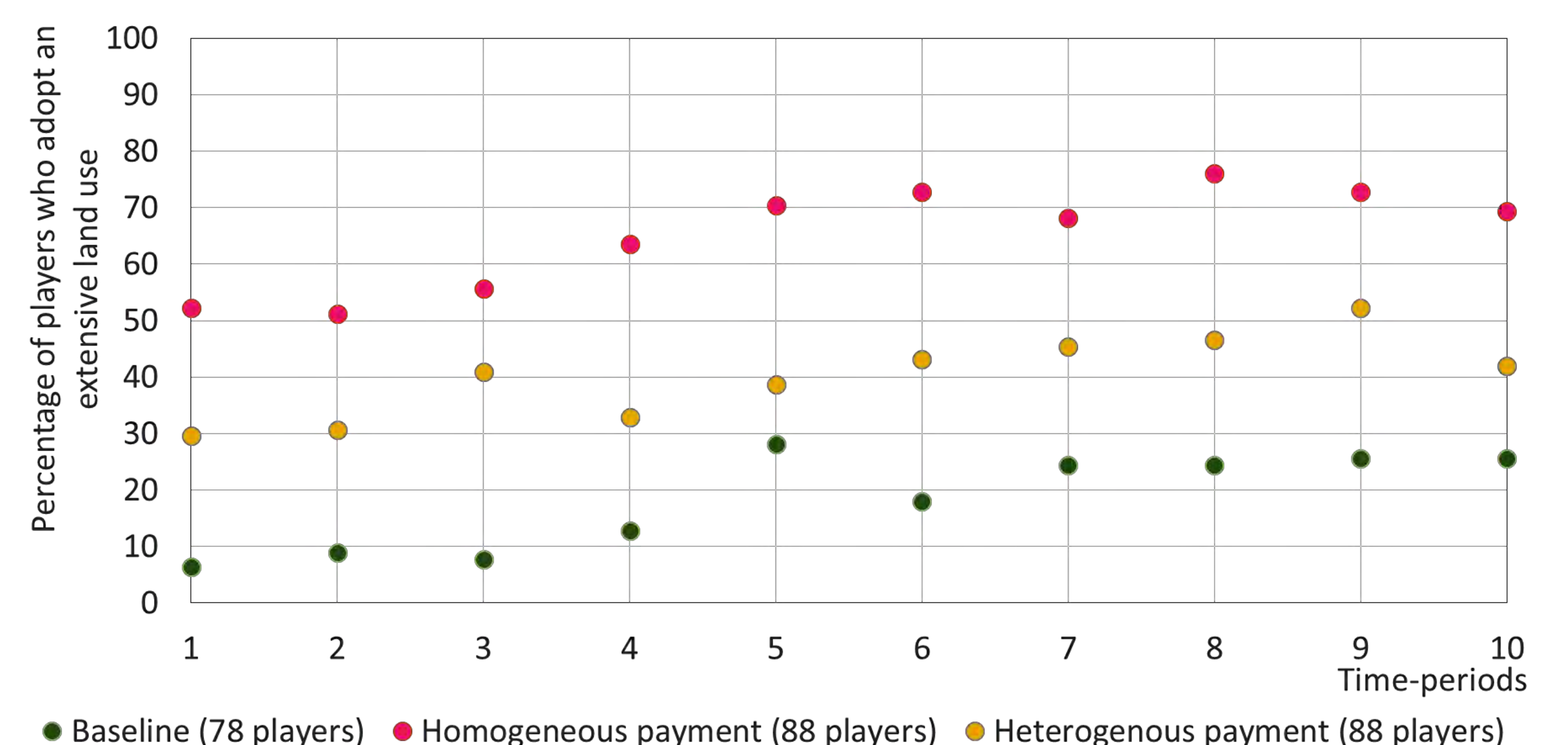
Treatment 2: X is a heterogeneous agglomeration payment: it is constant for H-farmer while it decreases for L-farmers proportionally to the decrease of farm profit. Farmers' potential payments evolve according to their respective opportunity costs.



Player's interface. Experiment available online at : peatgame.ethz.ch (number of windows = number of players); peatgame.ethz.ch/console (to pilot the experiment). The experiment was programmed by Orencio Robaina.

RESULTS

Comparative environmental effectiveness:



Comparison of the rate of players who adopt an extensive peat soil use in Baseline versus the two agglomeration payments

Main findings:

- Necessity of payment schemes to promote a more sustainable peat soil use. In the absence of policy: low willingness of H to rewet peat soils. The “**agglomeration payment**” is a promising approach in terms of environmental effectiveness.

Homogenous payment: 60% of players adopt an extensive land use as from the 1st period; a large part of the peat is preserved. Main driver of cooperation: profit maximization. Use of bargaining power by part of the H-farmers. More cost-effective and less inequality in payoff distribution than the heterogeneous scheme.

Heterogeneous payment: A large part of players only rewet peat soils after maximizing profit from vegetable farming → the peat is exhausted.

- For this issue, the homogenous payments appears more environmentally effective than the heterogeneous payment scheme.

- Need for a high incentive to ensure fast cooperation and thus preserve the peat. Large opportunity costs → need to elicit Society's willingness to invest in such high payments for the purpose of promoting sustainable peat soil use.