

# Games-based learning for aggregated farming in Kisumu, Kenya

**Andrew Reid Bell**

Environment and Livelihoods Modeling (ELM) Lab  
Global Development, Cornell University

With Wei Zhang<sup>2</sup>, Balentine Oingo<sup>3</sup>, Dickson Kinuthia<sup>2</sup>, Ivy Blackmore<sup>4</sup>, Upeksha Hettiarachchi<sup>2</sup>, and Kristin Davis<sup>2</sup>



Cornell University



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<sup>2</sup>International Food Policy Research Institute (IFPRI)

<sup>3</sup>[Independent consultant, Nairobi, Kenya]

<sup>4</sup>[Independent consultant, St Louis, MO]

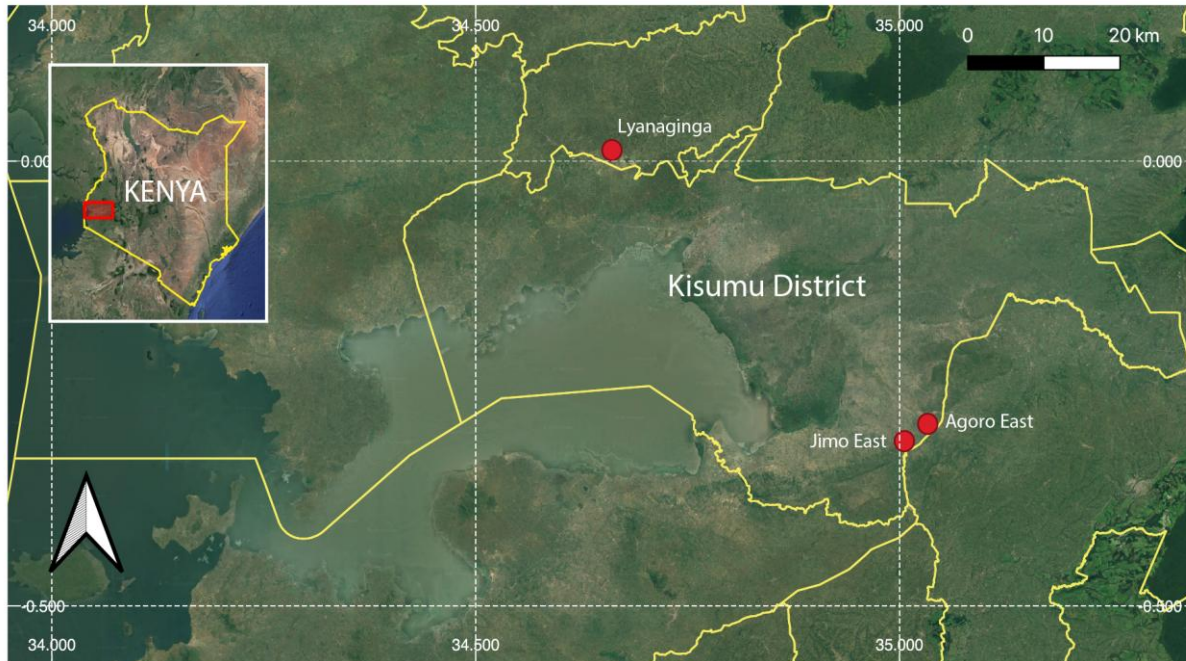


<https://elm-lab.org>



[andrew.bell@cornell.edu](mailto:andrew.bell@cornell.edu)

# Study sites



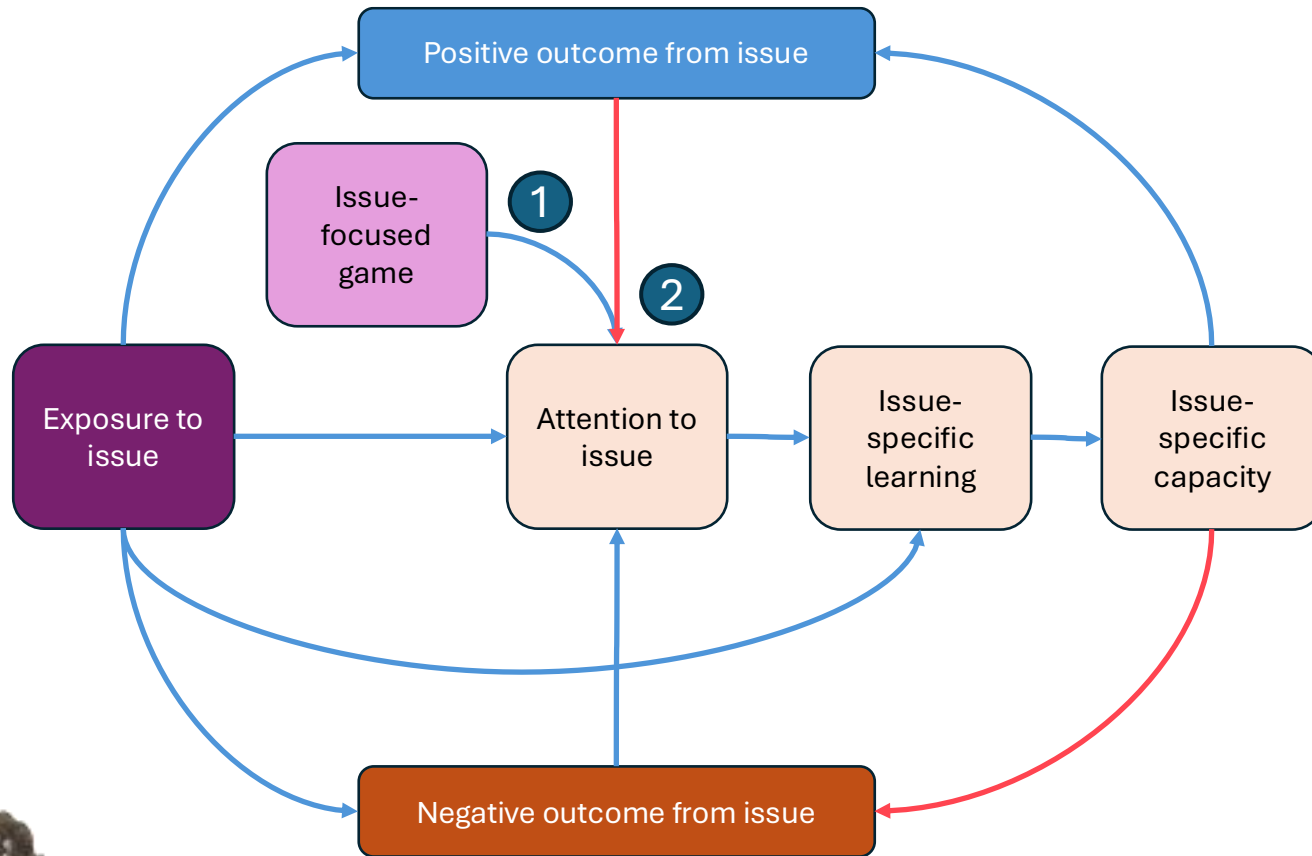
- Part of CGIAR Nature+ Programme
- Three sites in Kisumu, Kenya
- All participants under contract to operate 'aggregated farms'
- This is a new thing for everyone

**Overarching Research Question:**

**Can a games-based intervention help shift attention to possibly novel challenges under aggregated farming?**



# Theory of Change



Based on Falk et al. (2023), Bell et al. (2025)

Real-life exposure to issue allows learning, but with possible negative outcomes

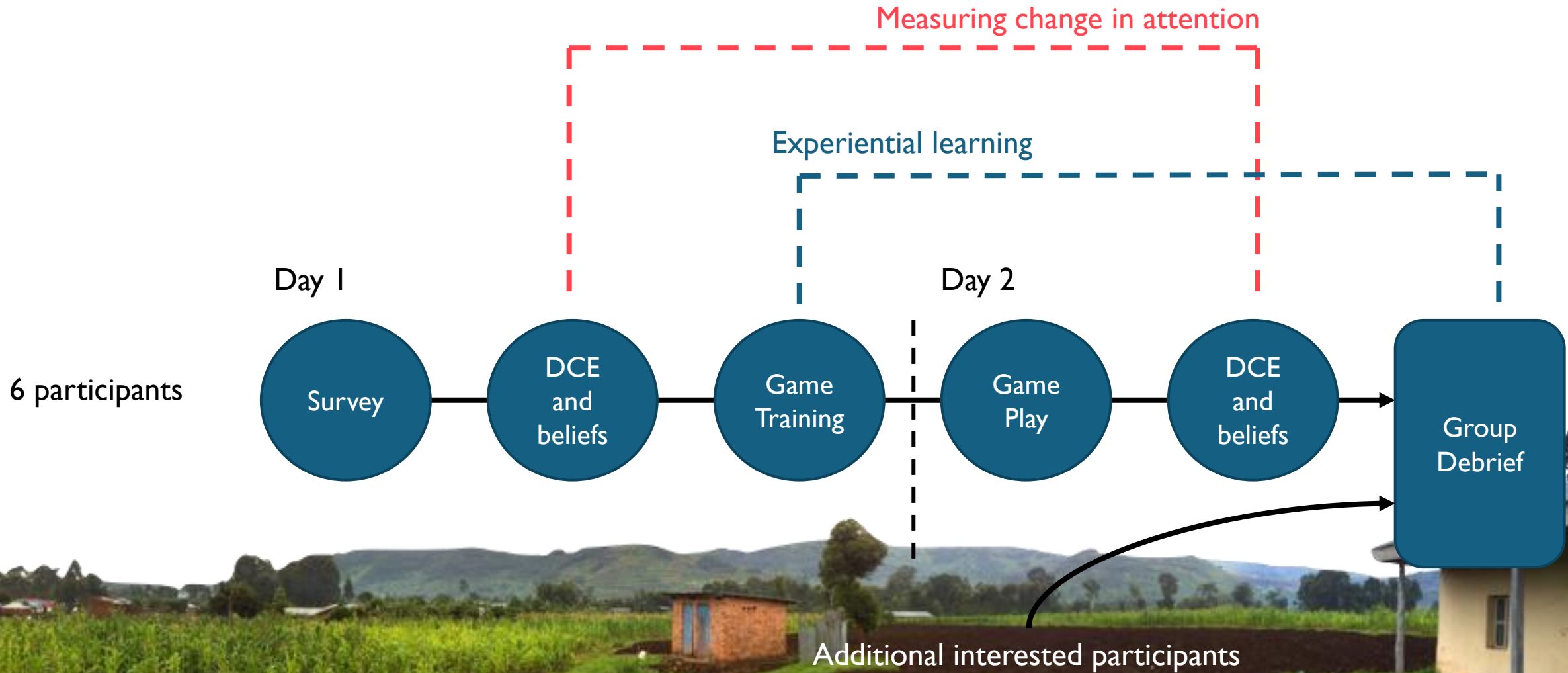
Experiential learning via game allows learning, with no exposure to issue

Specific RQs:

RQ1) Does game 'action situation' capture critical elements of real-life action situation?

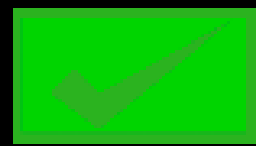
RQ2) Do we observe a shift in attention after game play?

# Intervention Design



Current round - phase

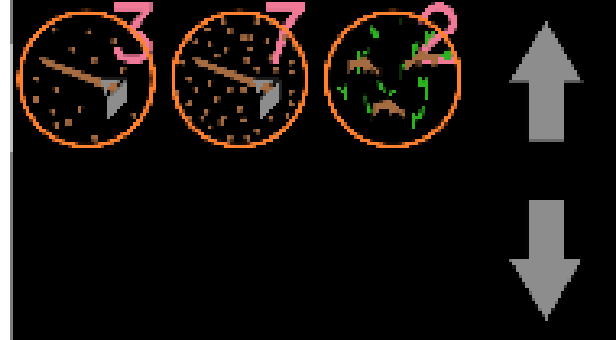
2 - 1



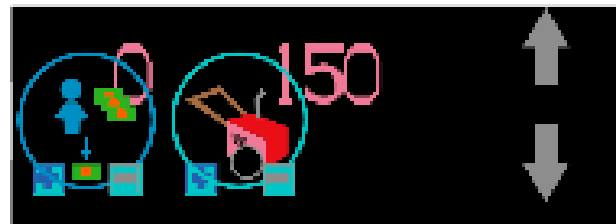
Current spending

0

(Spatial)  
Actions farmers can do  
on the land

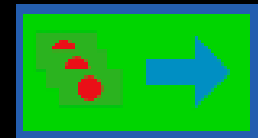


(Non-spatial)  
Actions farmers can  
take for their farms



Share

Total points



164

The main game board is a 6x6 grid of green squares. The top row contains a green checkmark icon, a yellow circle with '15' and a tractor icon, a green square with '2', a green square with '2', a red circle with '3' and a tractor icon, a red circle with '3' and a tractor icon, a red circle with '3' and a tractor icon, a red circle with '3' and a tractor icon, and a red circle with '3' and a tractor icon. The second row contains a red circle with '15' and a tractor icon, a green square with '2', a green square with '2', a red circle with '3' and a tractor icon, a red circle with '3' and a tractor icon, a red circle with '3' and a tractor icon, a red circle with '3' and a tractor icon, and a red circle with '3' and a tractor icon. The third row contains a red circle with '15' and a tractor icon, a black square with a large blue '13', a red circle with '3' and a tractor icon, a red circle with '3' and a tractor icon, and a red circle with '3' and a tractor icon. The fourth row contains a red circle with '15' and a tractor icon, a black square with a blue plus sign and a blue minus sign, a red circle with '3' and a tractor icon, a red circle with '3' and a tractor icon, and a red circle with '3' and a tractor icon. The fifth row contains a green square with '2', a black square with a red 'X' icon, a green square with a green checkmark icon, a red circle with '3' and a tractor icon, a red circle with '3' and a tractor icon, and a red circle with '3' and a tractor icon. The sixth row contains a green square with '2', a red circle with '30' and a tractor icon, a green square with '2', a green square with '2', a green square with '2', a blue circle with '3' and a tractor icon, a green square with '2', a green square with '3', and a green square with a tree icon. In the center of the board, there is a horizontal row of colored squares: blue, red, orange, purple, pink, yellow. To the right of these are a blue plus sign and a blue minus sign.

# SharedCropping

Example screens

# Game treatments

## Treatment 1 - Self

Players earn Kenyan Shillings according to their own score

- Players played Treatment 1 and one of Treatment 2a or 2b

## Treatment 2 - Group

2a - Players earn Kenyan Shillings according to the lowest players' score

2b - Players earn Kenyan Shillings according to the average score

- Order of Treatments 1 and 2a/b randomized

## Treatment 3 – Group-determined

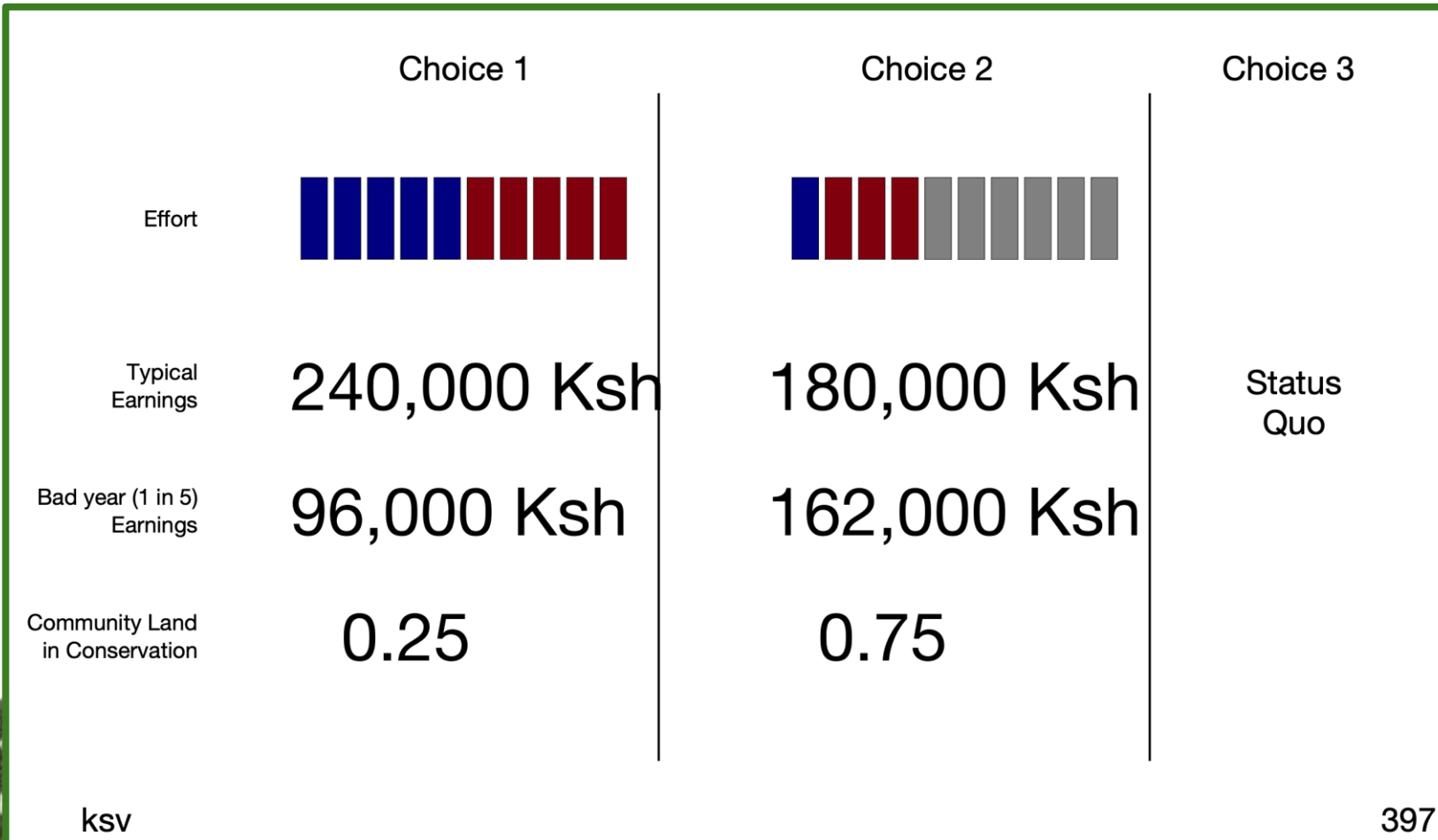
2a - Players earn Kenyan Shillings according a rule they agree to as a group

- Players always played Treatment 3 after completing Treatments 1 and 2a/b



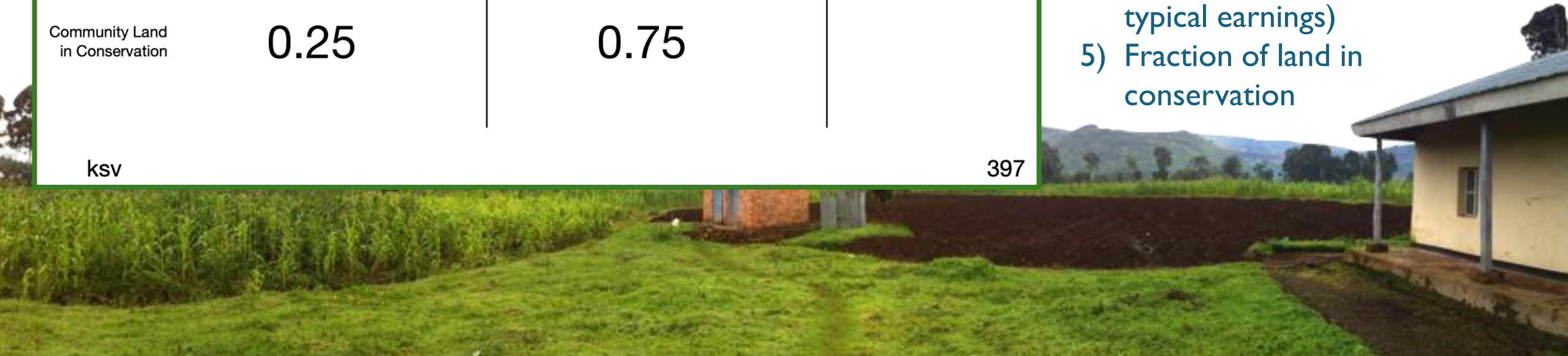
No  
control  
group

# Discrete choice experiment

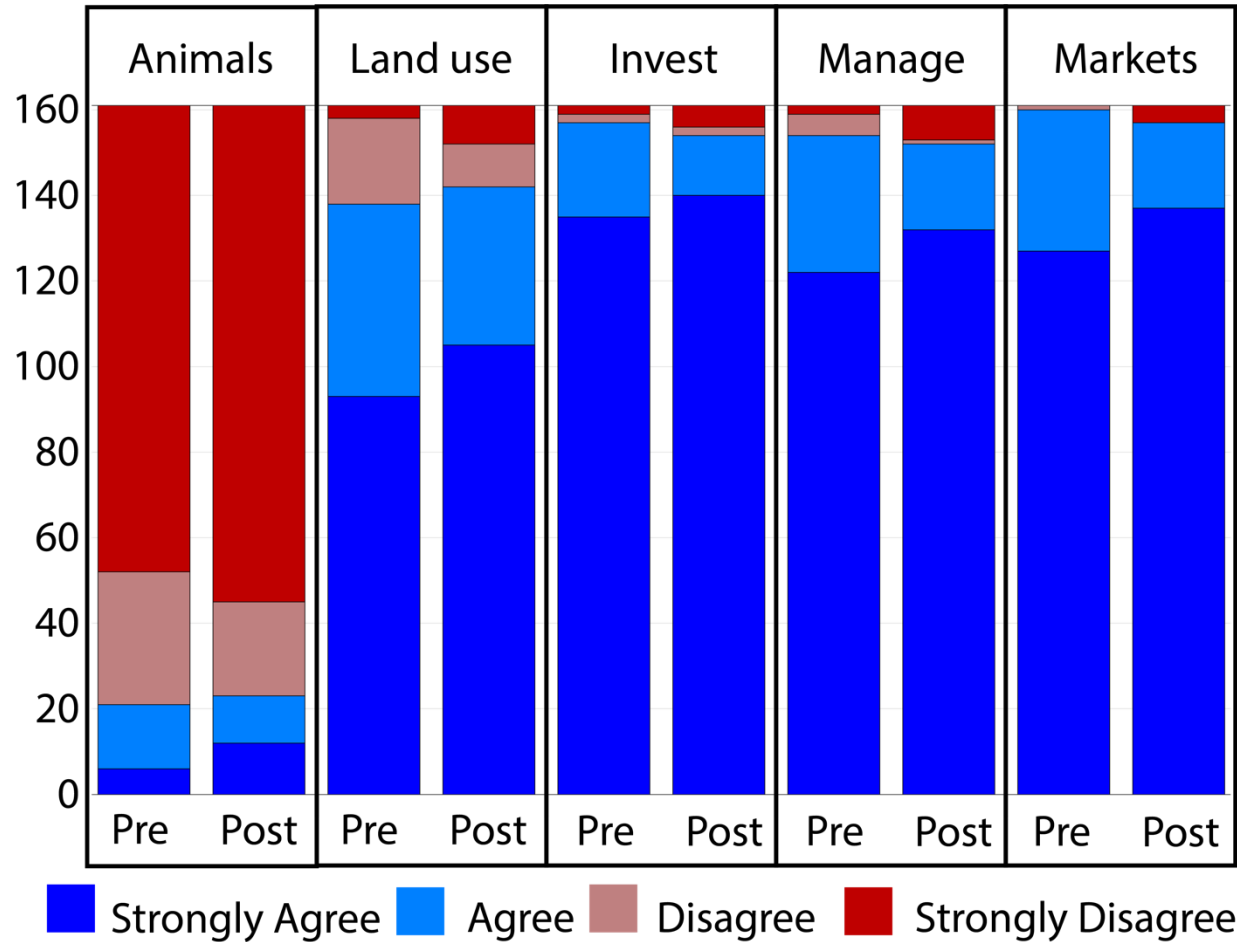


A choice of agricultural livelihood in five attributes:

- 1) Share of effort for private benefit
- 2) Share of effort for community benefit
- 3) Typical earnings (% of real-world reported earnings)
- 4) 1-in-5-yr low earnings (% of typical earnings)
- 5) Fraction of land in conservation



# Results – (Reported) Beliefs



Short name	Full Question
<b>Animals</b>	People should be able to raise however many animals they want and crop whichever ways they want, without any rules restricting how the animals are grazed or how the land is used.
<b>Land use</b>	Our land use (including farming approaches) now will affect the sustained availability and quality of the resource in the future for the community as a whole.
<b>Invest</b>	Community members should cooperate to invest in the establishment and maintenance of important community (public) structures such as drinking water wells, latrines, fences and community meeting places.
<b>Manage</b>	Community members should act collectively to manage grazing and crop lands.
<b>Markets</b>	Community members should act collectively to participate in markets for shared agricultural and animal products.

Strong collective beliefs before and after; some 'hardening' of stated beliefs pre- to post-gameplay

# Results - DCE

Outcome – Utility on choice option	Pre	Post
Fraction of land in conservation	2.565***	2.690***
Typical earnings	27.09**	12.15
Bad-year earnings	32.43***	45.34***
Time farming for self	-0.0607	-0.246
Time farming for group	0.811	1.729**
(Typical earnings) * (time farming for group)	-3.227	7.425
(Bad-year earnings) * (time farming for group)	-23.49	-45.01*
Observations	1,920	1,920

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Fit a mixed-logit model of:

- All main effects
- Interaction of earnings terms with shared effort

Pre-gameplay DCE:

Positive utility on conservation land, and typical/bad year earnings

Post-gameplay DCE:

Shared effort effect and interaction:

One reading of this:

The worse I experience downside losses,  
the more I value effort invested in community agriculture

# Results – DCE heterogeneity

	Fraction of land in conservation			Typical earnings			Bad-year earnings			Time farming for self			Time farming for group		
	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
Age	-0.0122	-0.00745	0.00473	0.0708	0.677***	0.606**	0.0417	0.177	0.135	0.0125	-0.00380*	-0.0163	0.0129	-0.00192	-0.0144
Years of education	-0.101	0.0793	0.180*	-1.990	2.469	4.458	-0.694	0.0542	0.748	0.142	-0.0458**	-0.188	0.0177	0.0687**	-0.0736
Female	-0.0545	0.242	0.297	3.506	8.529	5.023	1.130	3.589	2.459	-0.131	-0.0662	0.0644	0.0657	0.0124	0.143
Land holdings	0.233	-0.469*	-0.702***	-1.973	-12.18*	-10.21	-0.269	-1.297	-1.028	-0.0634	0.0713	0.135	-0.435	-0.109	-0.0457
belief_animals	0.0787	0.0957	0.0170	-4.230	3.138	7.368	0.585	-1.571	-2.156	-0.456*	0.0895**	0.546*	0.460	-0.0223	0.434
belief_landuse	-0.0969	0.222*	0.319*	-1.807	2.096	3.903	0.399	0.355	-0.0438	0.824***	0.0399	-0.784***	0.280	0.0110	-0.813***
belief_invest	0.0938	0.0184	-0.0754	0.799	-0.348	-1.147	0.972	1.786	0.815	0.292	-0.0565	-0.349	-0.860*	-0.0184	-0.311
belief_manage	0.249	-0.0678	-0.317	1.238	6.322	5.084	-1.436	-2.619	-1.183	-0.0522	0.0653	0.117	-0.0840	-0.0243	0.0278
belief_markets	-0.368	0.323	0.691*	-4.154	-7.650	-3.496	0.893	2.892	1.999	-1.028*	-0.00425	1.023*	0.0600	0.0714	1.099*
Constant	3.514***	1.678	-1.835	43.52**	-45.07	-88.59***	31.23***	36.30**	5.071	0.210	-0.237	-0.447	-0.847	1.820***	1.611
Observations	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155
R-squared	0.028	0.101	0.098	0.064	0.081	0.073	0.064	0.043	0.023	0.111	0.093	0.112	0.046	0.064	0.107

## Highlights:

- Larger landholders had less utility on conservation post-game
- Those who believe in self-determining animal grazing, increase utility on self time post-game
- Those who believe in collective land management, decrease utility on all effort post-game

# Results – Game play and heterogeneity

	Total Score	Variation in Score	Total yield	Grazing yield	Low-intensity yield	High-intensity yield	Average soil health along game	Number gifts
All female groups	511.6*	-4,210	111.3	-215.7**	71.75***	-13.58*	0.0654	-1.165
Mixed gender groups	701.4***	-6,701	48.82	-101.4	42.14***	-11.59	0.0733	0.0525
Treatment 2a	-893.5***	-59,603***	-45.66	6.999	8.196	-5.322	0.0786	1.910**
Treatment 2b	-17.94	-78,086***	142.3	-120.8	4.685	12.06	-0.159*	-0.694
Treatment 3	230.7	2,246	132.8	-14.86	5.920	2.420	0.00142	0.102
Site - Lyanaginga	1,388***	30,743	1,622***	-144.6	76.70***	27.79**	-0.0537	1.570
Site - Jimo East	497.4	29,523	754.6***	186.4*	2.370	6.667	-0.00852	-0.502
Age	-55.06***	-1,792*	-31.86**	5.022	-3.415***	0.251	-0.0145***	0.0441
Level of education	-663.8**	4,115	-132.6	280.1***	-86.77***	13.08*	-0.220***	-1.648**
Landholdings	530.6**	11,979	113.6	-149.7*	68.26***	-15.02*	0.184**	1.158
DCE preference - Typical earnings	-0.000816	0.128	0.00392	-0.00354**	0.000563*	0.000177	-5.56e-07	-2.96e-05*
DCE preference - Bad-year earnings	0.00476	-0.124	-0.00695	-0.000718	4.66e-05	-0.000197	1.93e-06	3.47e-05
DCE preference - Time self	-796.4***	-13,071	-512.4**	214.1***	-49.01***	-10.33	-0.0556	-0.745
DCE preference - Time share	-511.2	-55,349**	-802.9**	211.3*	-11.90	-36.21***	0.322***	-0.0538
DCE preference - Conservation	801.8**	-53,269**	-144.1	-422.5***	120.5***	-27.60**	0.325**	0.496
Cattle holdings	4.882	6,868	97.98	71.99**	-16.09**	4.726	-0.0250	0.345
Sheep/goat holdings	87.34**	-2,974	25.26	-37.04***	10.32***	-1.171	0.00825	-0.0773
Constant	7,733***	399,435***	7,466***	-701.3	271.7**	159.6**	2.420***	4.566
Observations	71	71	71	71	71	71	71	71
R-squared	0.630	0.599	0.549	0.444	0.659	0.538	0.513	0.405

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Highlights:

- Less variation in score in Treatments 2a/b; lower scores in 2a
- Female and mixed groups earn more from low-intensity agriculture
- Younger, less-educated, and larger-landholdings have higher scores, higher soil health

# Debrief and follow-up

Shared Cropping highlighted some key questions for farmers:

- What would the rules be like for sharing effort and reward?
- How should people with more or less land contribute?

Revisiting 6 months later and sharing results:

- How can we share responsibilities across men and women?
- How can we keep people showing up and contributing?



# Summarizing

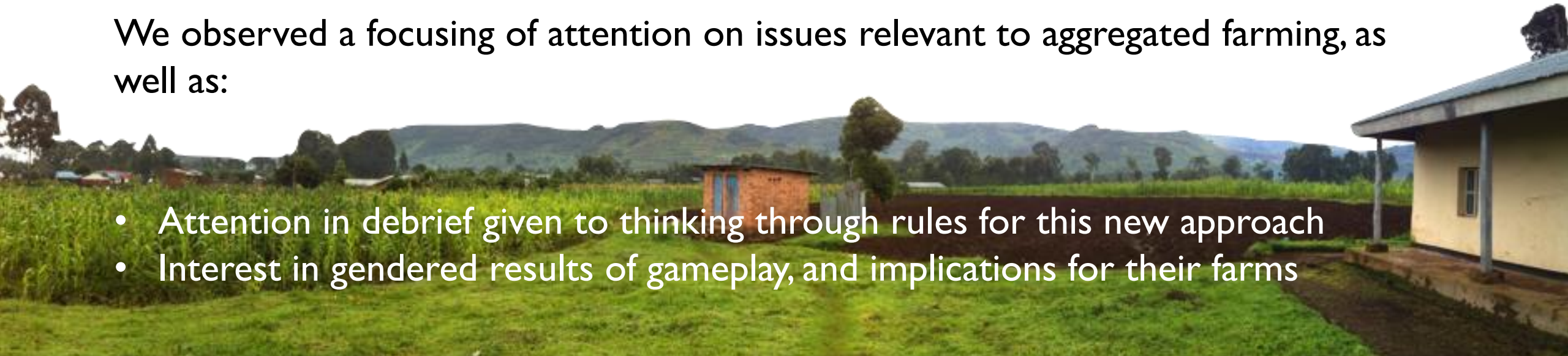
We present a novel game ShareCropping, embedded in a training intervention for aggregated farms, asking:

**Can a games-based intervention help shift attention to possibly novel challenges under aggregated farming?**

Yes.

We observed a focusing of attention on issues relevant to aggregated farming, as well as:

- Attention in debrief given to thinking through rules for this new approach
- Interest in gendered results of gameplay, and implications for their farms



Thank you for your kind attention



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@earth-andrew



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