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Envisioning collective action for sustainable resource management

An economic experiment

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Abstract: Participatory vision-building (PVB) seems promising in fostering collective action to overcome complex social-environmental dilemmas and to attain socially desirable outcomes. By assisting the relevant actors in visualising their desired future and imagining how it would feel to be an active part of it, PVB makes the stated goals experiential, inspirational and meaningful, galvanising collective action. Nevertheless, it is still unclear whether PVB's causal impacts on collective action go beyond those of other elements of participatory processes that PVB also comprises, i.e. social interaction, information exchange and coordination around desirable strategies, outcomes or futures. We contribute to filling this gap through a (pre-registered) framed lab-in-the-field economic experiment conducted with 728 farmers from Lake Tota, Colombia. Participants chose between two stylised farming practices over multiple hypothetical growing seasons, impacting their seasonal earnings and the water levels of a hypothetical lake as a shared resource. We compare the behaviour of participants in a PVB treatment, in which they discussed and imagined a desired vision for the future, against the behaviour of participants in three control conditions. Albeit potentially effective for cooperation, the effects of PVB were found to be statistically indistinguishable from other participatory processes with similar aims. However, exploratory analysis suggests there might be potential impacts of PVB on emotions and preferences for pro-environmental and pro-social action. Future research could test the generalisability of our findings to other contexts, particularly those with heterogeneous interests, delve deeper into the underlying psychological mechanisms, and explore the interplay with other institutional mechanisms for fostering sustained collective action.

Keywords: social dilemmas, collective action, natural resource management, participatory processes, participatory governance, visioning

JEL: D02, D70, D91, H40, Q20, Q24, Q25, Q57, Q59

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1. Introduction

Overcoming complex social-environmental dilemmas requires aligning individual interests and activities with socially desirable outcomes (Ostrom 2010a and 2010b; Muradian and Cardenas 2015). Participatory resource governance processes aim to convene the relevant actors and foster common understandings and agreements on desirable rules, norms or shared strategies (e.g. NRC 2008; Ortiz-Riomalo et al. 2023a). This paper focuses on participatory vision-building (PVB) as a participatory approach with a particular promise for collective action. PVB facilitates the participative construction of a shared vision of a desirable future by the relevant actors. The vision contrasts the present state of affairs, going beyond the careful diagnostic of a current problem to setting a desirable goal (Senge 1990; Meadows 1994; Costanza 2000; Wiek and Iwaniec 2014). Through different types of visualisation, narrative, story-telling and other creative techniques, visions illustrate—and thereby help to imagine—how such a future state will look and feel once the goals are achieved, making the stated goals experiential, inspirational and meaningful (Meadows 1994; Pereira et al. 2019; Wiek and Iwaniec 2014).

Thus, PVB could provide the inspiration and motivation to harmonise conflicting interests and thus facilitate transitions towards sustainable social-ecological outcomes (Senge 1990; Meadows 1994; Rudd 2000; Costanza 2000; Wiek and Iwaniec 2014; Cork et al. 2023). The available literature describes PVB's features and potential outcomes (e.g. Wiek and Iwaniec 2014; Iwaniec and Wiek 2014; Cork et al. 2023). Nevertheless, PVB's causal impacts on collective action and the possible underlying behavioural mechanisms have not been disentangled (Wiek and Iwaniec 2014; Cork et al. 2023). In particular, it is unclear whether PVB's impacts go beyond those of other elements of participatory processes that PVB also comprises, such as social interaction, information exchange and coordination around desirable strategies, outcomes or futures, which have proven effective in overcoming collective action challenges (Ostrom 2006; Pavitt 2018; Koessler et al. 2021).

We contribute to filling these gaps by using an experimental approach. Specifically, we conducted a framed (lab-in-the-)field economic experiment (Harrison and List 2004) with 728 farmers of a prominent water resource system in the Colombian Andes. In groups of four, farmers had to decide among two stylised farming practices for several growing seasons (rounds). Their decisions affected their seasonal earnings and a hypothetical shared lake's amount of water. Before starting the activity, a group conversation differed between our experiment's randomly assigned treatment (PVB) and control conditions. Control conditions facilitated discussions on (a) desirable practices, (b) common goals, and (c) desirable futures under an externally given vision. Participants could not talk during the remaining activity, and our procedures were to ensure privacy and anonymity in their decisions. Farmers received their earnings in local currency, which depended on their individual decisions and their share in the final amount of water in the lake. To establish the causal impacts of PVB, we compare individual and collective behaviour in treatment groups against those in the control groups. With a complementary survey and a donation task, we gathered information on participants' understanding, perceptions, emotions, beliefs, and environmental and other-regarding preferences to explore underlying mechanisms. In Section 2, we expound on our methods. In Section 3, we elaborate on our hypotheses and their underpinnings. In Section 4, we present our main results; in Section 5, we discuss them, and in Section 6, we conclude.

2. Data and methods

2.1 The study area: an Andean water resource system, the Lake Tota

We conducted the experiment in Lake Tota, in Boyacá province, northeastern Colombia. According to official sources, about 6685 households and 2000 to 3900 agricultural production units are distributed across four municipalities (Aquitania, Cuítiva, Sogamoso, and Tota) and 21 villages. Most people live and cultivate in Aquitania, the largest municipality located on the eastern side of the lake's area. The primary crops are long green (Welsh) onion, potatoes, and berries. The intensive use of water, fertilisers and fresh manure has affected soil, water and biodiversity. The main social-ecological challenge by the diverse involved actors is to adopt crops and production technologies compatible with socially desirable outcomes such as water provision, biodiversity conservation, nature protection, and human well-being (Rodríguez et al. 2021a and 2021b), a challenge that is also prominent and common in other agriculturally-based water resource systems (e.g. Robertson et al. 2022).

2.2 The group activity (economic game)

We built a 'lake game' based on Meinzen-Dick et al.'s (2016) groundwater game and Cardenas et al.'s (2013) watershed (or water irrigation) game. Appendix A contains the game's instructions. Here, we summarise the main features (see also Figure 1)

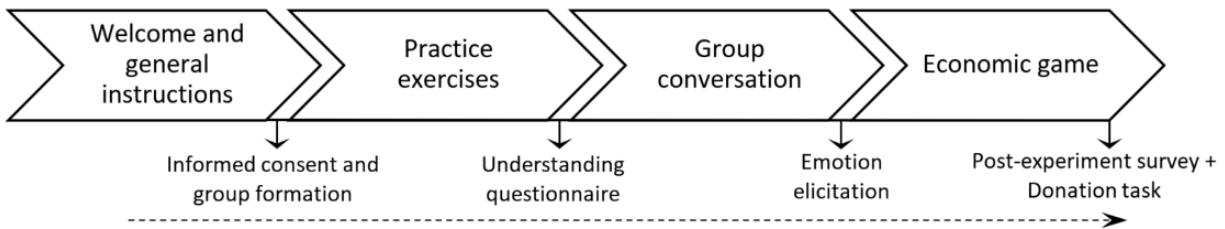


Figure 1 – Experiment design

Basic decision situation

The economic situation simulated in the experiment involved four participants – people involved in farming activities in the area – deciding how to manage a hypothetical shared lake for several growing seasons (rounds). In each season, participants had to select in a decision form between two farming practices: Option A and Option B. Option A generated \$18.000 COP (Colombian pesos, approx. €4) for the participant and subtracted three water units from the shared lake at the end of each growing season. Option B generated \$8.000 COP (approx. €2) and subtracted one water unit. At the end of each round, each participant received a voucher indicating their round earnings and a flyer showing the lake's total water loss. The activity ended when the lake had seven or fewer water units or at the tenth round. The participant could see the state of the lake at the beginning and the end of each round when indicated.

The lake started with 50 water units and naturally recharged four water units at the beginning of each growing season. Hence, the amount of water varied depending on the participants' decisions and the natural recharge of water. A whiteboard containing 50 blue cards represented the shared lake during the activity. (They were brown on the flip side to represent the water loss.) Each water unit (i.e. blue card) had a monetary value of \$4.000 COP (around €1). The lake's final value was distributed evenly among the four

members of each group. So, at the end of the activity, participants received the sum of their earnings from each growing season and their share of the lake's value in COP. Participants knew all the above information, except that the game ended after ten rounds.

Practice exercises

After delivering the basic instructions for the activity, we conducted three exercises for participants to practice the specific procedures, understand the rules, and answer any remaining questions about the activity. These practice exercises recreated the procedures of a typical growing season but had no implications on participants' earnings. Participants did not have to make any active choices during these exercises. They only received the instruction to adopt a given farming practice (i.e. Option A or Option B). Then, they saw the immediate and long-term impacts of choosing the instructed farming practice for several rounds on their earnings and the state of the lake during the activity. Each exercise recreated a different hypothetical strategy scenario. In the first exercise, we instructed all participants to select Option A. Hence, they visualised the impacts of choosing Option A every round on their – and the other participant's – earnings and the state of the lake. In the second exercise, they visualised the impacts of choosing Option B every round. In the third and last exercise, we instructed two participants to select Option A and two to select Option B to help them visualise the impacts of adopting two types of farming practices. Facilitators and moderators used poster infographics to explain and help participants visualise the outcomes of the different strategy scenarios. We kept the same order for each practice exercise every session.

2.3 The treatment and control conditions

After the practice exercises, we allowed participants to discuss the possible strategies and outcomes they could and would like to materialise in the activity based on the scenarios considered during the practice exercises. Specifically, four main types of group conversations varied in their focus and guiding questions and thus constituted the treatment and control conditions of our experiment. Group moderation guidelines to ensure an even-handed deliberation of the proposed topics and questions and foster consensus-building were the same across treatment and control conditions. Everything else (i.e. the practice exercises, game, individual survey and donation task) remained unaltered across treatment and control groups. Each group was randomly assigned to one type of group conversation (see Appendix B for details on the randomisation procedure).

In the **participatory vision-building (PVB) treatment**, participants received instructions to collectively build a vision of the future they want to realise for the shared lake. We invited them to imagine how the lake looks, the earnings participants obtain, and the farming practices participants implement in their desired future.¹ In the control treatment interventions, participants received instructions to discuss the farming practices they want to implement (**desired practices control condition, P**), the outcomes they want to realise, as well as the farming practices they wish to implement (**common goal setting control condition, CG**), and lastly, the future they want to realise for their shared lake considering an expert vision (**exogenous vision control condition, EV**). Furthermore, in the PVB and EV conditions, we encouraged

¹ We designed the PVB treatment to recreate the main features that well-designed participatory visioning processes usually comprise (Meadows 1994; O'Brien and Meadows 2007; Wiek and Iwaniec 2014). To hone these treatment instructions, we received input from previous participants in and also from experts on visioning processes.

participants to imagine how it feels to see their desired future come true and participate actively in its realisation. Table 1 summarises the common vs. specific elements of the group conversations across conditions.

Element	PVB (Treatment)	EV	CG (Control conditions)	P
Focus of discussion	<i>“...the <u>best possible future</u>; to build a <u>vision of the future</u> [participants] would like to realise.”</i>	<i>“...the <u>best possible future</u> [...] <u>considering a proposed vision</u> for the future by other participants.”</i>	<i>“...the <u>best possible outcomes</u> [participants] would like to realise, and the <u>agricultural practices</u> [they] would like to implement.”</i>	<i>Discuss “...the <u>agricultural practices</u> [participants] would like to implement”</i>
Vision-related interventions prior to group discussion	Individual visioning exercise	The facilitator introduces the external vision		
Topics of guiding questions for group discussion	The <u>desired future</u> (i.e., how the lake looks and how much participants earn in their desired future)	The desired lake’s state and participants’ earnings, <u>considering the external vision of the future</u>	The desired lake’s state and participants’ earnings	
	The farming practices the group implements in their desired future	The farming practices participants want to implement, <u>considering the external vision of the future</u>	The farming practices participants want to implement	The farming practices participants want to implement
	The participants’ feelings about seeing their desired future realised and themselves being an active part of it	The participants’ feelings about seeing the external vision’s future realised and themselves being an active part of it		
<p>PVB: ‘Participatory vision-building’, P: desirable practices, CG: common goal setting, EV: exogenous vision. Conversation elements are displayed in the sequence followed during the experimental sessions. Individual visioning exercise: The facilitator encouraged participants first to imagine – eyes closed, sitting back to back – and then exchange their dreamed future regarding the lake’s state and the participants’ earnings, farming practices and feelings face-to-face. He clarified that the individual visions would serve as input for the group’s shared vision. The research team built the external vision of the future based upon the visions crafted by the first 19 groups assigned to the PVB treatment, and it was narrated using infographics and post-its.</p>				

2.4 Outcome and control variables

The primary outcome variables for our analysis are group and individual cooperation. The lake’s value in Colombian pesos at the end of the game (lv) is the indicator of group cooperation and farmer i ’ selected

farming practice in round r (fis_{ir}) the indicator of individual cooperation. It takes the value of '1' if the individual chooses Option B and zero otherwise. We consider participants' emotions, beliefs, and pro-social and pro-environmental preferences as secondary outcome variables. Relevant variables that can influence the variance of these outcome variables are participants' (i) sociodemographic characteristics, (ii) understanding of and previous information about the activity, and (iii) broader context (i.e. municipality effects). Furthermore, individual cooperation could also depend on round and facilitator effects and the lake's water level at the start of a given round. We control for the potential effects of these variables in the statistical analysis (see Section 4). We elicited the secondary outcome variables and the control variables through a five-part survey during the experiment: we applied an understanding questionnaire after the practice exercise, elicited participants' emotions after the group conversation, and gathered the rest of the information after the economic game by applying a survey and, after handing out participant's earnings, conducting a donation exercise (see Figure 1 and Appendix A).²

2.5 Sampling strategy and general procedures

Our sampling strategy and general procedures were inspired by previous work by Cardenas and Ramos (2006), Meinen-Dick et al. (2016) and Ortiz-Riomalo et al. (2021). To convene the participants to our experiment, we created a registry of potential participants with their basic information (contact, village of residence, cultivated crops, crops' location and primary water source for irrigation, and involvement in any farming association). For this purpose, the field research team, guided by local leaders or key informants, directly visited the 21 villages in Lake Tota between the beginning of June and the end of October 2023. There were various visits to the same village to ensure that most, if not all, of the villages' sections were visited. We obtained additional data points from trusted community leaders and inhabitants who either already knew or, following our guidelines, contacted people directly involved in farming activities (preferably crop managers). In addition, farmers who learned about the project activities from other farmers, farmer associations, their neighbours, friends, relatives, or acquaintances who had or had not participated in the project activities contacted us to participate. We included in the dataset only people involved in farming activities, prioritising during the call those who reported managing their or others' crops and plots, being involved in long green (i.e. Welsh) onion farming, irrigating with water from the lake and who have not previously participated in participatory processes for agriculture transformation.³ We cross-checked all these registries to avoid duplicate entries. The field team also visited those villages and sections where onion farming was relatively more intensive more times than the other villages.⁴ Ultimately, this registry of potential participants included 1458 people.

The team used this dataset to invite as many farmers as possible to the experiment to meet the sample size target ($n = 640$). We recruited 728 participants (sample descriptives are in Table B1 in Appendix B).

² We followed this order to capture participants' perceived emotions immediately after the group conversation and assess the potential treatment effects on these. We left the elicitation of the other information for the end so as not to influence participants' perceptions and thus avoid confounding the potential treatment effects we seek to identify.

³ Since there have been other participatory action research projects in the area to foster sustainable transformations in the agricultural sector, we wanted to assess the potential of PVB on those farmers who have not had these previous experiences.

⁴ We took into account the most up-to-date data on the distribution of onion farmers and farming plots around the lake (DANE 2014).

In setting up the sessions, we strove to organise sessions with farmers who cultivated crops in different villages and municipalities and did not know one another. In each session, after we delivered the general instructions and the participants provided informed consent, we (quasi-)randomly divided participants into two four-person groups, each allocated to a separate room. Participants who knew one another were allocated to different groups. Group assignment to conditions and rooms was random. (See Appendix B for more details regarding the sampling strategy, the session plans and randomisation procedures.)⁵

Once in their corresponding room, a dedicated facilitator and a monitor guided the participants through the practice exercises, the group conversation and the economic game. To reduce potential demand effects (Zizzo 2010), we reminded participants before the start of the economic game that there was no right or wrong answer; they could freely select their preferred option based on the provided information.⁶ During the economic game, they sat around the whiteboard (i.e., the hypothetical lake) with their back to the other participants and could not communicate. Their decisions were private and recorded anonymously by the group's designated monitor. With these procedures, we sought to recreate a setting in which resource users do not know one another and cannot communicate often, yet must decide how to perform their activities and manage a shared water resource system upon which their livelihoods depend. We also sought to heighten the sense of anonymity participants had during each session.

3. Hypotheses

Prior experiments recreating social dilemma situations in the lab and the field have shown the potential of group communication, strategy coordination, agreement building and goal-setting processes for collective action (Rudd 2000; Ostrom 2006; Koessler et al. 2021). In turn, literature on the design features, impacts and mechanisms of (group) processes aimed at fostering participative and imaginative narratives, future-thinking and vision-building highlight the potential of these for promoting and sustaining collective action around sustainable pathways and socially desirable outcomes (Wiek and Iwaniec 2014; Cork et al. 2023). These processes can generate the motivations, emotions and beliefs needed to effectively coordinate action around the outcomes desired by the collective (Meadows 1994; Costanza 2000, 2014). On the flip side, poor process design, implementation and monitoring can overstrain expectations, generate frustration, and feed into mistrust, ultimately undermining collective action (see Reed 2008; Quist et al. 2011; Martin et al. 2014; Reed et al. 2018; Cork et al. 2023).

We aim to assess the causal impact of participatory vision building (PVB) on collective action for sustainable resource management (i.e., a hypothetical shared lake in this case). As described above, the treatment intervention of our experiment induces participants to collectively build a vision of the future they want to realise for their shared water resource system. We hypothesise that participating in a well-

⁵ In addition to the control conditions described in Section 2.3, 11 groups were assigned to a control condition in which group communication was not structured (i.e., a free communication control). Given the paper's focus (i.e., the assessment of the impact of PVB on collective action beyond other arguably effective structured participatory processes), we do not discuss this data further. Hence, the main analysis of this paper focuses on the 171 groups (i.e. 684 subjects) allocated to the treatment and main control conditions described in Section 2.3. We exclude the data from the 44 subjects allocated to the free communication control.

⁶ If a participant could not read or had recurrent problems understanding the activity's procedure, the group's monitor or a dedicated research team member reiterated to that person, in private, the features of each farming option and explained how to mark their preferred option. We annotated the groups in which such assistance was necessary and tested the robustness of our results to exclude these sessions. The results did not change.

designed vision-building process fosters collective action in social-environmental dilemmas beyond the effects of features that PVB shares with other participatory approaches (namely, structured communication around desired outcomes and strategies). We thus postulate that **(H1:)** *PVB fosters (individual and group) cooperation beyond the effect of simply having participants discuss the farming practices they wish to implement in their shared lake [i.e., Control condition P]*, and that **(H2:)** *the effect of having participants discuss a common goal—i.e., the outcomes they want to realise and farming practices they wish to implement in their shared lake [i.e., Control condition CG]—does not fully account for the result of the PVB treatment*. Furthermore, we hypothesise that the impact of PVB goes beyond that of an externally imposed vision. In other words, **(H3:)** *the effect of having participants discuss their desired future (outcomes and farming practices) under an exogenously provided (expert) vision for their shared lake [i.e., Control condition EV] does not fully account for the result of the PVB treatment*.

To test our hypotheses, according to our pre-registered analysis plan,⁷ we bilaterally compare the individual and group cooperation levels of participants in the PVB treatment against those of the participants in P (for testing H1), CG (for H2) and EV (for H3). To explore the possible behavioural drivers, we also study the potential impact of PVB on participants' emotions, beliefs, and (pro-social and pro-environmental) preferences. The results of the pre-registered main and secondary (i.e. exploratory) analysis are in Section 4 and Section 5, respectively. The results of any analysis that was not pre-registered are considered exploratory and thus included in Section 5.

4. Data analysis and results

First, we focus on the average and median level of group cooperation, measured by the lake's value at the end of the activity. Figure 2 shows, in a violin plot, the distribution of the outcome variable across treatment and control conditions. Summary statistics are in Tables C1 and C2 in Appendix C.

On average, groups assigned to the PVB condition attained 41% of the social optimum. In contrast, groups attained, on average, only 33% in the P control condition, in which participants' group conversation focused on desirable practices. Median cooperation was also higher under PVB (35% vs. 17%). Furthermore, 62% of the PVB treatment groups achieved at least 30% of the social optimum (the sample's median value), compared to 49% of the groups in the P control. However, these differences in average and distributions are not statistically significant [Wilcoxon rank-sum (Mann-Whitney) test: $z = 1.65$, $p = 0.0989$].⁸

Compared to the CG control condition, in which participants focused on deriving common goals, the average group cooperation in PVB was slightly lower, but the median cooperation was the same. Interestingly, the distribution of group cooperation seems more dispersed in the CG condition than in the PVB treatment condition. Although seven groups reached the social optimum under CG (vs. only one group under PVB), only 51% attained at least 30% of the median value (vs. 62% of the PVB groups). Nevertheless, these differences are again not statistically significant [Wilcoxon rank-sum (Mann-Whitney) test: $z = 0.294$, $p = 0.7690$].

Finally, we find that, on average, the groups that participated in the vision-building process (i.e., PVB) cooperated more to maintain the value of their shared lake than those who discussed their desired future under an exogenous vision, i.e. the EV control condition. The mean and median of group cooperation were

⁷ <https://doi.org/10.17605/OSF.IO/JMXV6> (Registration prior to data analysis.)

⁸ For a result to be statistically significant, $p < 0.05$

larger under PVB than under EV. The fraction of groups reaching at least 30% of the social optimum was also larger under PVB (62% vs. 52%). However, the differences are also not statistically significant here [Wilcoxon rank-sum (Mann-Whitney) test: $z = 0.958$, $p = 0.3381$]. Regression analysis, also when controlling for the potential effect of other explanatory variables, undergird these results (see Table 2, panel A)).

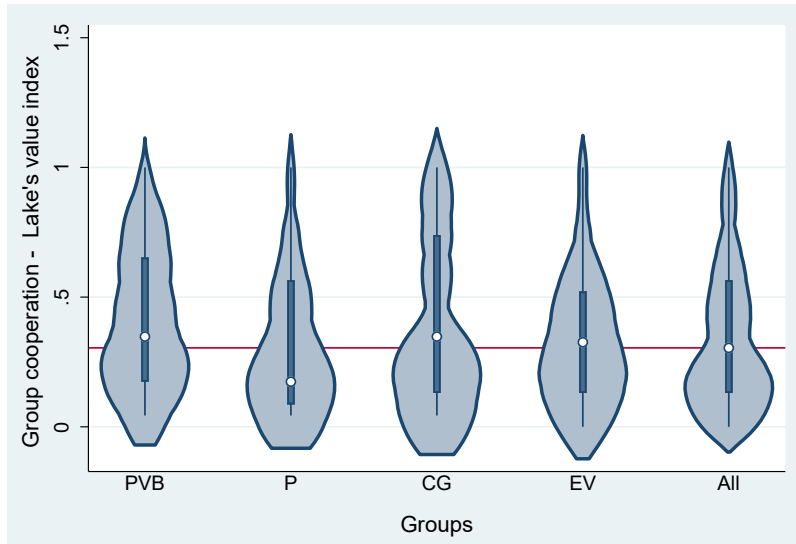


Figure 2 – Violin plot of the group cooperation index by condition

PVB: ‘Participatory vision-building’ treatment, **P:** desirable practices control condition (P), **CG:** common goal setting control condition, **EV:** exogenous vision control condition, **Total:** All 171 groups. The group cooperation index indicates the fraction of the social optimum the group attained at the end of the game. The reference line marks the median group cooperation of all groups considered (PVB, P, CG and EV).

Next, we turn to individual cooperation. Here, we focus on the farming practices adopted by farmers each round and use logistic regressions (with standard errors clustered at the group level) to calculate the potential effect of PVB on the probability of adopting sustainable practices (i.e., Option B in the game). Participation in the PVB treatment seems to make adopting these practices potentially more likely. Nevertheless, these differences are not statistically significant – with and without controlling for other relevant explanatory variables (see Table 2, panel B).

In sum, our results thus do not provide statistically significant support to our hypotheses. Generally, except for the comparison between PVB and CG, the direction of effects is as hypothesised. However, the impacts of PVB on individual and group cooperation cannot be statistically distinguished from the effect of simply having participants discuss the farming practices they wish to implement in their shared lake (condition P), the effect of having participants discuss a common goal (condition CG), nor the effect of having participants discuss their desired future under an exogenously provided vision for their shared lake (condition EV). The results of our statistical analysis are robust to the exclusion of (i) participants who knew about our research activity from previous participants in the game, (ii) participants who had previously participated in programmes to foster transformation in agricultural practices towards increased

sustainability or climate adaptation, (iii) participants who were in groups in which experiment sessions had any potentially critical implementation defect, and (iv) participants who were in groups where other participants require special assistance to understand and participate in the game. (In the Appendix C, Tables C4 - C7 contain the complete results of these robustness checks).

Variables	Group cooperation <i>Lake's value index</i>		Individual cooperation <i>Farming practices (Option B=1)</i>	
	(1A)	(2A)	(1B)	(2B)
CG	0.0287 (0.697)	0.0479 (0.475)	-0.107 (0.801)	0.169 (0.677)
EV	-0.0471 (0.468)	-0.0516 (0.425)	-0.128 (0.720)	-0.0820 (0.817)
P	-0.0726 (0.253)	-0.0847 (0.183)	-0.589 (0.107)	-0.425 (0.239)
Constant	0.413*** (0)	0.667** (0.0260)	1.179*** (9.29e-07)	2.163*** (0.00409)
Control variables	No	Yes	No	Yes
Sample	171 groups	171 groups	684 individuals (6447 observations)	613 individuals (5796 observations)

Groups and individuals in PVB, CG, EV and P

Panel A presents the results of Tobit models estimated assuming lower and upper censoring and calculating robust standard errors. Panel B presents the results of logit models calculating robust standard errors clustered at the group level. P-values are in brackets (***) p-value < 0.01, ** p-value < 0.05 and * p<0.1). The dependent variable in Panel A, the lake's value index, is the value of the lake resource at the end of the game relative to its maximum level possible, i.e. it indicates what proportion of the social optimum was achieved. In Panel B, the dependent variable is the farming practice adopted by a participant in a given round (= 1 if the sustainable farming practice was adopted; 0 otherwise). Control variables include age, sex, highest attained level of education, daily individual income, wealth (adjusted value of the land, animal husbandry, livestock, and equipment owned by the participant at local market prices), number of managed crops, number of managed crops irrigated directly from Lake Tota, a binary variable indicating if the participant has sources of income other than agriculture in the Lake Tota, transportation costs to and from the experiment venue, binary variables indicating the participants' municipality, the participant's level of understanding of the activity, the way participants were informed about the activity, the participants' acquaintanceship with other group members, previous participation in other agricultural or agroecological programs in the region, and potential facilitator effects. All control variables were rescaled using min-max normalisation. Control variables were averaged at the group level for the regression analysis of group cooperation (i.e., panel A). The entire sample included groups assigned to PVB, P, CG and EV. PVB was used as the base category in these regressions to show the comparative results. Table C3, in Appendix C, display the coefficient estimated for each control variable.

5. Discussion

We discuss the results considering our research aims and scope, the features of our experiment design, potential limitations, and alternative explanations of our findings. We recapitulate our study aims and then discuss whether our results may be specific to the experimental design, sample, or context studied. Finally, we explore potential alternative explanations. We conclude in Section 6.

5.1 Study aims and scope

Our study was motivated by the potential of PVB described in a broad body of qualitative literature, including theoretical and case study research (e.g. Kallis et al. 2009; an der Helm 2009; Quist et al. 2011; Wiek and Iwaniec 2014; McPherson et al. 2017; Pereira et al. 2020; Cork et al. 2023). A shared vision arguably facilitates the convergence of individual interests and courses of action into socially desirable outcomes (Senge 1990; Meadows 1994; De Geus 2002; van der Helm 2009; Quist et al. 2011; Wiek and Iwaniec 2014). A vision has been argued to provide not only the guidance and orientation (i.e. the focus) but also the inspiration and motivation (i.e. the energy) to materialise desirable long-term outcomes and sail through challenging circumstances (Senge 1990; *ibid.*). Although theoretical and case-study research has contributed to formulating valid arguments regarding its potential for collective action, research has yet to adequately assess and isolate PVB's specific effects (Wiek and Iwaniec 2014; Cork et al. 2023). Therefore, our study contributes to causally identifying the impacts of PVB on collective action in social dilemma situations relative to other participatory elements. This is important because PVB interventions share several features with other participatory methods, and sponsors and organisers of participatory policy processes must select among a handful of approaches the most fitting and cost-effective to the context (Bryson et al. 2013; Newig et al. 2018; Reed et al. 2018; Andersson 2022).

Our experimental design allows assessing the added value of PVB as compared to three such participatory approaches: a deliberation around desired farming practices (control condition P), a deliberation on desired outcomes and related practices (common goal setting, control condition CG), and a deliberation revolving around desired future outcomes and practices under an externally provided (expert) vision of the future (exogenous vision, control condition EV). Contrary to our hypotheses, our results do not imply an added value of PVB compared to these three alternative approaches. It should be noted that our design did not include a non-intervention control. Thus, we cannot assess whether PVB improved resource management outcomes compared to a case without policy intervention. Given the abundant evidence highlighting the benefits of communication (e.g. Ledyard 1995; Balliet 2010; Pavitt 2018), and given the usual constraints on feasible sample size in the field, we consciously opted to focus on our main research question, i.e. whether PVB has an added value compared to other, well-structured, yet relatively more straightforward participatory interventions. The P condition can be seen as a baseline representing a facilitated deliberation to facilitate consensus-building on desirable farming practices.

5.2 Considerations of the study design

Our sample size is in line with and even surpasses that of previous laboratory experiments (e.g. Koessler et al. 2021) and lab-in-the-field experiments on related participatory methods (e.g. Cardenas et al. 2013; Meinzen-Dick et al. 2018; Ortiz-Riomalo et al. 2021). However, the data suggests that the difference between the treatment and control conditions, i.e. the precise PVB's effect size is small and statistically indistinguishable. Hence, we cannot rule out that with a way larger sample, we would have been able to detect a (very) small statistically significant effect

Regarding our study's specific design, sample and context, we aimed to conduct the experiment with actual resource users (farmers) and frame it around a resource management issue they could easily relate to (farming practices affecting water quantity and quality in a jointly used lake). Moreover, the experiment was incentivised such that cooperation benefits and costs were considerable. On average, participants earned about twice as much as the *daily* salary for a two-hour experiment session. Our observations

(including those of the field research team) suggest that participants engaged in the economic game seriously, were aware of the costs and benefits of their decisions, and related to what occurred to them in their daily lives.

As common in experimental studies, the design implied simplification as a stylised representation of a common-pool resource problem. A simplification that may have affected our results is that our setup assumed homogenous resource users, i.e. all participants faced the same payoff structure. We opted for design to reduce the cognitive complexity of the game and because pre-tests indicated that the most basic condition (P) left sufficient room for improvement. (In fact, the average value of the resource stock at the end of the game was only 33% of the social optimum for groups under the P condition. Only two groups reached the social optimum (i.e., all their members adopted sustainable farming practices throughout the game). Thus, we expected that an added value of PVB should be visible in the homogenous setting. An expectation that the above results contradict. This design feature of homogeneous resource users likely made cooperation easier to achieve with the help of the other (control) participatory interventions than in the more complex case of heterogeneous payoffs. It is conceivable that the added value of a jointly developed vision plays out more strongly when resource users differ, e.g. in terms of wealth, plot size or dependence on agriculture. However, our statistical analysis suggests that variations in these factors in participants' backgrounds did not significantly affect individual or group cooperation (see Table C3 in Appendix C). Therefore, a natural extension of our work would be to incorporate heterogeneity in the game structure, e.g. in the form of different endowments, activity costs, or benefits from the common pool resource. Complementary qualitative and quantitative analysis could then analyse the interplay between the features of the group composition, the group conversation outcomes and dynamics, and the participant's decisions (within and outside the game).

The experimental setup also required structuring the PVB process to a considerable degree. The qualitative literature argues that shared visions should be the result of deftly organised, fair and inclusive participatory processes (O'Brien and Meadows 2007; Wiek and Iwaniec 2014; Cohen et al. 2019), involve the relevant actors, map out their diverse perspectives and help them craft a shared vision (O'Brien and Meadows 2007; Kallis et al. 2009; Iwaniec and Wiek 2014; Wiek and Iwaniec 2014). It has also been argued that vision-building should be complemented by allowing participants to develop strategies for concrete action to materialise the shared vision (ibid; Meadows 1994; Quist et al. 2011; Nieto-Romero et al. 2016). We incorporated these critical aspects in our experimental design. Nevertheless, it may be that the PVB process was too short or stylised to allow for the activation of positive emotions, amongst other inner factors motivating collective action. Emotions have been hypothesised to be an essential channel through which PVB works (Meadows 1994; Wiek and Iwaniec 2014). We thus engage in exploratory analysis regarding the impacts that PVB had on emotions and other secondary outcomes, such as belief and preferences for pro-environmental and pro-social action, and compare these impacts to those in the other three conditions.

5.3 Exploratory analysis of potential effects on secondary outcomes

Our exploratory analysis indicates that PVB affected so-called positive and negative emotions, increasing the likelihood of participants feeling both (see Table C8 in Appendix C). We focused on inspiration, happiness, sadness and frustration. We find that PVB significantly increased the level of inspiration compared to the P control but has no statistically different impact compared to the CG and EV

conditions. However, PVB seems to have significantly increased participants' sadness and frustration compared to the CG and EV controls. At the same time, PVB impacts on these emotions seem statistically indistinguishable from the P control.

These results could indicate a disillusionment effect. The joint vision may inspire (and illusion) participants and, simultaneously, make them feel sad and frustrated, e.g., because of the difficulties they face in attaining it. Such an effect could also help explain why we find no added value in PVB. In our design, where data collection was performed in one session, it seemed convoluted to elicit emotions multiple times in quick succession. Therefore, we opted to elicit emotions only once after the group discussion but before the actual cooperation decisions were made. Consequently, we cannot test for a dynamic evolution of emotions. It would be interesting, in future research, to separate the vision-building and realisation phases more in time and elicit emotions at both data collection points.⁹

Besides affecting emotions, the PVB treatment could also impact participants' beliefs on others' likely cooperation and expected cooperation (i.e., participant's first and second-order beliefs) and their preferences for pro-environmental and pro-social action. However, our results indicate that PVB had no statistically significant added impact on either pessimistic or optimistic beliefs (see Table C10 in Appendix C). Likewise, there were generally no statistically significant differences in participants' support of pro-environmental statements between treatment and control conditions (see Table C11 in Appendix C). However, in the donation task, participants in PVB donated a larger share of their earnings to a pro-social and pro-environmental cause that would benefit the lake's farmers and sustainability than participants in the other conditions. This effect is statistically significant only when comparing PVB to EV, while there is no significant difference to the other control conditions. Thus, there is some (though weak) indication that PVB (in comparison to EV) can potentially affect participants' preferences for pro-social action (see Tables C12 and C13 in Appendix C.3 for details).

5.4 Impacts of vision quality and degree of consensus

Finally, the impact of PVB could also depend on the quality of the vision developed or the degree of consensus. Differences in these aspects could lead to heterogeneity in the impacts of PVB. Particularly, positive impacts in groups with agreement on a high-quality vision may be offset by negative impacts in groups that disagree or do not manage to develop an inspiring vision. Delving into these aspects, we find that PVB groups that reached a consensus on socially optimal outcomes and corresponding practices¹⁰ were relatively more successful in cooperating than those that did not reach such consensus. Of all PVB groups, 69% reached that consensus, and on average, attained 44% of the social optimum and adopted the sustainable practice 65% of the time. The rest who did not reach that consensus (31% of all PVB groups), attained 34% of the social optimum and the sustainable practice 61% of the time. This suggests

⁹ To explore the idea of a disillusionment effect with the data we have, we analyse the dynamic pattern of cooperation over time by including interaction terms between treatment and round number. These results, however, indicate that the rate at which the lake's water level decays is not more significant, on average, in the PVB treatment than in the control groups. Although there seem to be round effects, these do not vary by condition. Cooperation decays over time (i.e. participants seemed less likely to adopt the sustainable farming practices in latter rounds), but not at a statistically significantly different rate (see Figure C1 and Table C9 in Appendix C).

¹⁰ They agreed to have the lake with the maximum possible water level and choose Option B (every round), the sustainable farming practice.

that the participatory process's results (i.e., the outputs) may be relevant in explaining differences in cooperation and cooperation outcomes.

6. Conclusion

Our study contributes to the research on the potential of participatory governance, participatory processes and collective action to overcome complex social-environmental dilemmas (e.g. Ostrom 2010b; DeCaro et al 2015; Bodin 2017). It complements emerging research disentangling the causal impacts of participatory policy interventions on behaviour in social dilemma situations via lab and lab-in-the-field economic experiments, an approach followed in two earlier studies on other participatory methods (different elements of structured communication (Koessler et al. 2021) and perspective-taking (Ortiz-Riomalo et al. 2021)). Our results suggest that the impacts of PVB are not statistically distinguishable from those of other participatory methods, such as discussions on common strategies, common goals, or an externally provided vision. Regarding policy implications, we might cautiously conclude that for settings where resource users are relatively homogenous, the added cost and complexity of PVB interventions may not be worthwhile compared to simpler-to-implement participatory approaches such as those reflected in our control conditions. A conversation focused on consensus-building around desirable outcomes and practices would be particularly promising for its cost-effectiveness. However, future research should test the generalisability of this conclusion to other settings (e.g. in terms of parameters, game structures, and cultural context) where cooperation is more difficult to achieve, particularly when allowing for socio-economic and/or cultural heterogeneity among resource users in the setting recreated in the experiment.

Our exploratory analyses suggest that PVB, even in this study's simplified recreation, can affect participants' emotions and somewhat their preferences for pro-social action. However, these effects seem not to translate into significant effects of PVB on sustained collective action in strategic, interdependent settings such as the one recreated in our experiment compared to other participatory methods with similar aims. Ultimately, the effects may depend on the types of inner factors such as emotions and preferences that are (not) affected, the conduction of the process and the larger context influencing the prospects of collective action, including the broader institutional context and political economy. Future research could delve deeper into the potential underlying psychological mechanisms and their interplay with institutional mechanisms such as participative sanctioning, monitoring or conflict resolution (i.e. continued deliberation). These are mechanisms that could potentially help enhance and sustain the initial effects of PVB and other related approaches on participants motivations for collective action (cf. Cardenas et al., 2004; Rustagi et al., 2010; Dal Bó and Dal Bó 2014; DeCaro et al. 2015; Ortiz-Riomalo et al. 2023a and 2023b).

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Appendixes

A. Experiment procedures, instructions and materials

Welcome and general information

Person B0: Hello and welcome. Thank you for taking the time and effort to join us for this meeting. We are conducting a research project funded by the German Research Foundation (i.e. DFG) and implemented by the University of Osnabrück (Germany).

As part of the research project, we want to understand how people involved in agriculture decide their farming practices in a given territory. In today's meeting, we want to gather information to help us understand how you make these decisions as a farmer. We will first conduct an economic exercise and then an individual survey. Because of your knowledge and experience in the area, your participation is crucial to the success of this project.

Farmers must choose the farming practices they want to use each growing season, and their choices affect both their income and the environment. The (economic) exercise we will do today simulates such a situation. At the end of the meeting, you will receive, in Colombian pesos, the income you have earned from your choices during the exercise. The money will not come out of our pockets and is not a payment for your participation in the meeting. This money comes from the DFG (the German Research Foundation). It is part of the design of the research methodology, as it helps us to recreate more or less realistically the types of choices and challenges farmers face.

The meeting will last a maximum of three hours. Please focus on the activities of the meeting and avoid, as far as possible, any distractions that may divert your attention from them. We will be holding similar meetings with other people from the municipalities of Aquitania, Cúitva, Sogamoso, and Tota. Please do not share your decisions, answers, or details of the meeting with other farmers of the region so that they can also come and participate on equal terms. If you know of others interested in participating, you can provide us with their contact details at the end of the meeting or give them our contact details. We will schedule their participation in one of the following meetings. We hope to return in 2024 to share the research results and appreciate your discretion until then.

Before starting the activity, we will carefully read the informed consent form *[Read the informed consent form aloud and clearly, allowing time for questions]*. If you agree with its contents, write your name in the blank space, sign the form, and add your ID card and mobile phone number. We will scan this form, and if you wish, you can ask for the original at the end of the activity. Don't forget to ask for it before leaving if you want it.

Before signing, we would like to ask: Is there anyone who does not agree to sign the informed consent form and, therefore, wants to participate in the activity? *[Participants are expected to respond]*

[If there are exactly four or eight people, continue with 'Basic instructions for the activity'].

[If there are more than four people or more or less than eight people, continue with the following script:].

We appreciate your interest in participating. We are delighted to have you.

However, today's activity requires a precise number of participants. We can only do it with 4 or 8 people. Therefore, we will ask ___ of you *[specify here the number of extra people]* to reschedule your participation. Pre-registered people who are rescheduled from other sessions or are coming from distant places will stay. The others will pick a white piece of paper. Marked pieces of paper indicate that the person must leave this session and be rescheduled to a future meeting.

[To the participants that must leave, another person from the field research team says:]

Unfortunately, you will not participate today. However, we will compensate your transport costs and invite you to choose another day and time. *[Show them the session program and ask them to choose a day and time slot]* If you come next time, you can take your participation for granted—unless less than four people show up. We regret and apologise for any inconvenience this decision may cause, and we hope to see you soon.

Instructions for group activity

Let us start with the activity (i.e., the economic exercise). First, I will explain in general terms what the activity is about. Then, I will organise you with three other people with whom you will interact during the activity. Each group will participate in a separate room. Once in your assigned room, you will do three practice exercises to ensure you understand the activity's rules and procedures.

In general, the agricultural practices chosen for each growing season affect each person's production and income level, as well as the environment in which the activity is carried out [Pause briefly.] Today, we will try to recreate this situation. The activity simulates several growing seasons in which you must privately and individually select the type of farming practice you want to perform.

It is not a test, as there are no right or wrong answers. You must decide freely which type of farming practices you prefer based solely on the information you have about the characteristics of each option concerning the profits and impacts it generates in each growing season, similar to what you do in your farming each growing season.

In the situation we recreate, you are part of a hypothetical lake you share with three other people. *[Point to the lake]* Only you and the other three people use the lake. However, we assume you do not know each other and cannot communicate. To recreate this situation, you will sit with your back turned and can see the lake only when we tell you to.

We will represent the amount of water in the lake with these blue cards; we will call them water cards *[Point to the lake and the cards]*. At the beginning, the lake has 50 water cards. The brown cards represent the water lost from the lake, and their number changes depending on the farming practices you and the other beneficiaries of the lake choose, as well as the natural recharge of the lake from season to season. *[Take one card and show how its colour changes by flipping it]*.

In reality, the lake's natural recharge varies seasonally e.g., depending on how much rain falls, whether in winter or summer. Here, we simplify this process. No meteorological seasons exist, and we assume the lake constantly recharges the same amount of water. At the beginning of each growing season, the lake recovers four water cards (i.e., we flip four brown cards).

Now, if the amount of available water (i.e. the number of water cards) decreases below a certain level, it is no longer possible to continue cultivating, and the activity ends. This happens if the number of water cards drops to seven or less at the end of the season.

At the end of the activity, the benefits generated by the water left in the lake will be distributed equally among those who share the lake. Each of these water cards is worth \$4,000 COP. For example, if ten water cards are left at the end of the activity, the lake will be worth \$40,000 COP, and that value will be shared among the four beneficiaries, \$10,000 each.

In each growing season, you must make the same decision. You must choose between two farming practices: Option A and Option B. *[Unroll the infographic with the expanded version of the participants' decision format to show the two options.]* Often, it is possible to choose between several farming practices. Simplifying, we assume that only two types of practices can be selected in each growing season. At the beginning of each growing season, you will receive a decision format like this one that summarises the essential information of the activity: the main characteristics of Option A and Option B, the number of water cards that the lake naturally recharges, and the minimum amount of water needed to maintain production around the lake. You will have two minutes to mark an X on your preferred option when you receive it.

Option A earns you \$18,000 COP and takes three water cards from the lake each season, i.e. converts three water cards into brown cards at the end of the growing season. Option B earns you \$8,000 COP each season and removes one water card from the lake, i.e. converts one water card into a brown card at the end of the growing season. *[Use the expanded version of the decision form to indicate these values].*

Once you mark your decision, my colleague will pick up the form, anonymously record your decision, and calculate how much water the lake has lost during the season. Depending on which option you choose, in private, my colleague will give you a voucher like this one showing how much income you have earned at

the end of each season. You will receive a voucher for \$18,000 if you choose Option A and another for \$8,000 if you choose Option B *[hold up one of the vouchers and show it to each participant]*. At the end of the meeting, after completing the individual survey, we will exchange the amount specified on all the vouchers you received during the activity for Colombian pesos. *[Long pause]*.

In addition, together with the voucher, my colleague will also give you a small flyer informing you how much water the lake has lost at the end of the season, which depends on the type of farming practices that you and the three other people you were assigned with chose during the activity. When you receive the voucher and the flyer, you can see the state of the lake, i.e. how many water cards it has at the end of the season after you and the other group members have made your choices.

If the lake has at least eight water cards, the activity continues, and for the next growing season, the lake is naturally recharged by four cards: four brown cards become water cards in the lake again *[illustrate this on the lake]*. The new season starts, and we repeat the process. My colleague hands out the decision format, and we follow the same steps.

Remember that the amount specified on the vouchers is money you will receive at the end of the activity. It is guaranteed. If your vouchers add up to \$80,000, we will give you \$80,000 COP in cash at the end of the activity. In addition, the value of the remaining water in the lake, i.e. the value of the remaining water cards, will be distributed equally among the participants. Remember that each water card is worth \$4,000 COP and that each brown card has no value. If you, for example, leave twenty water cards at the end of the activity, you will receive the value of five water cards, that is, an additional \$20,000 COP on top of the value of the vouchers.

In summary, your total profit depends on the income generated by your selected farming practices in each growing season and the remaining water in the lake at the end of the activity. You will receive your total earnings after answering the individual survey at the end of this meeting before leaving.

Also, remember that there is no right or wrong decision or answer. It is best to choose only the option you prefer based on the information provided and to express your thoughts freely in your answers. In addition, your choices are private and anonymous. Your choices will not be known to other participants during the activity.

You will be given a blank sheet of paper to record what is happening in the activity or make notes or drawings of your choice. We will not collect it at any time. If you like, you can use it. It's no problem if you don't.

Some things may not be entirely clear, or there may still be questions. We will now do three practice exercises to let you gain experience in how the activity works. During the practice exercises, you can ask all the questions you have.

[If there are eight participants:]

Before starting the practice exercises, we will form two groups of four people. You will receive number 1 or 2. Those with number 1 will *[go to] [stay in]* room _____, and those with number 2 will *[go to] [stay in]* room _____.

Practice exercises

[Person in role B1, now in the room with their group, continues – make sure that each participant sits facing outwards, with her back to the others around the lake]: You may have questions about some aspects of the activity that you have not fully understood. We will now do three practice exercises to understand the rules and procedures better. In each exercise, we will tell you which decision to make and show you the results of your choices. You can ask as many questions as you want during these three exercises, and we will come to your station and solve them with you. However, we invite you to please remain silent.

Exercise - Step by step

[At the beginning of the first practice exercise:] We start in the first growing season. My colleague *[i.e. Person C]* will give you the decision form. Please do not mark it until she or I tell you to do so. When you receive the decision form, you can turn around and see the state of the lake at the beginning of the season. You can do this when instructed to do so. *[Person C hands each participant the decision form and tells them that they can see the state of the lake at the beginning of the season.]* Now, look at the decision form and examine the consequences of each type of farming practice you could implement, Option A or Option B. Do not tick either option yet. *[Once Person C has given the decision form to each participant, Person B1 tells everyone:]* **[For the first practical exercise only:** In this practical exercise, and only for these practical exercises, my colleague will tell you which option to choose. Mark it on the decision form, then fold it twice, raise your hand with the folded form, and hand it in when asked]. **[First practical exercise:** Person C instructs each participant to tick Option A. **[Second practical exercise:** Person C instructs each participant to tick Option B. **[Third practical exercise:** Person C tells two participants to tick Option A and two others to tick Option B. *[Person B, once Person C has told each participant which option to tick:]* My colleague *[i.e. Person C]* now collects the folded forms to record his decision, **[from the second season:** and the flyer with the water loss information] calculate his profit and estimate the water loss from the lake in this season. *[Person C collects all the folded forms, records the participants' decisions, and calculates the value of the vouchers and the loss of water from the lake].* My colleague *[Person C]* informed me of the water loss during the season. I update the status of the lake, converting the water cards lost from the lake into brown cards and noting the number of water cards remaining in the lake at the end of the season *[Person C informs Person B1 of the loss of water from the lake and Person B1 updates the status of the lake. In the meantime, Person C prepares the vouchers and the flyer reporting the water loss].*

After updating this information, my colleague will hand you the voucher with your winnings and a flyer summarising the amount of water lost in the lake by the end of the season. At that point, you can turn around and see the state of the lake again. *[Once Person B1 has updated the status of the lake, Person C hands out the vouchers and flyers to the participants and says:]* These are the earnings for the farming practices you chose *[hands out flyer]*, and this is the total amount of water lost for the practices chosen by you and the rest of the beneficiaries of the lake this season. You can now turn around and see the state of the lake.

With this, we end the first growing season. The following season is the second season, season two. The lake is naturally recharged with four water cards at the beginning of the growing season; then, I turn four brown cards blue *[Person B1 updates the number of water cards on the board]*. My colleague *[i.e. Person C]* will hand you the decision form and, at that time, you will be able to see the state of the lake at the beginning of the new season *[Person C hands each participant the decision form, picks up the flyer, asks them not to fill in the decision form and to turn around to see the state of the lake.]*

Feedback on short-term results

[Use the horizontal infographic]

[Person B1 continues:] **[Only in the first practical exercise:** Note that you will get the same benefits if you make the same choice every growing season. Similarly, suppose you, the other beneficiaries of the lake, and the other members of your group continue choosing the same farming practices. In that case, the lake will lose the same amount of water each season. Let's see what happens throughout the activity in this scenario. Take a look at this infographic. In the scenario we recreated in this exercise, **[First practice exercise:** each participant chose A.] **[Second practice exercise:** each participant chose B.] **[Third practice exercise:** two participants chose B and two others chose A.] If you and the lake beneficiaries keep deciding the same each season, **[First practice exercise:** each participant receives a voucher for COP 18,000] **[Second practice exercise:** each participant receives a voucher for COP 8,000] **[Third practice exercise:** those who choose A receive a voucher for COP 18,000, those who prefer B receive a voucher for COP 8,000] at the end of each season.

In turn, the lake loses **[First practical exercise:** 12 water cards – 3 for each of you –] **[Second practical exercise:** 4 water cards – 1 for each of you –] **[Third practical exercise:** 8 water cards – 6 for the two people who adopted A and 2 for the two people who adopted B –] at the end of each growing season. The lake is naturally recharged with four water cards at the beginning of the next season *[Show the change from the end of the first season and the start of the next season using the horizontal infographic of the respective practical exercise].*

Feedback on long-term results
[Use the vertical infographics]

Thus, the lake **[first practical exercise:** loses eight water cards successively from one growing season to the next and is left with six cards in the fifth season. After that fifth season, the lake is left with less than seven cards, and the activity ends.] **[Second practical exercise:** does not lose water cards from one season to the next, and the lake's water will remain above seven water cards.] **[Third practical exercise:** loses four cards from one season to the next and is left with six in the tenth season. After that season, the lake is left with less than seven cards, and the activity ends.] In the infographic, you can see how your profits and the amount of water in the lake would vary throughout the activity due to the agricultural practices that you and the other beneficiaries of the lake choose *[Show the evolution of what the evolution of profits and the state of the lake would look like throughout the activity using the vertical infographic of the respective practical exercise].* In the end, **[First practical exercise:** each participant receives \$ 18,000 COP for each of the seasons in which they chose A.] **[Second practical exercise:** each participant receives \$ 8,000 COP for each of the seasons in which they decided B.] **[Third practice exercise:** those who chose A receive \$18,000 COP for each of the seasons in which they chose A, and those who chose B receive \$8,000 COP for each of the seasons in which they decided B.] In addition, **[First and third practice exercises:** six water cards remain, each worth \$4,000 COP. Therefore, the total value of the remaining water cards is \$24,000 COP. As those benefiting from the lake share this value equally, it is divided by four, and each beneficiary of the lake gets COP \$6,000 at the end of the activity.] **[Second practical exercise:** Forty-six water cards remain, each worth COP 4,000. Therefore, the total value of the remaining water cards is \$184,000 COP. As those benefiting from the lake share this value equally, it is divided by four, and each beneficiary of the lake gets \$46,000 COP at the end of the activity]. This gain is added to their gains for the number of times they have chosen **[First practical exercise:** A] **[Second practical exercise:** B] **[Third practical exercise:** A or B] *[Show the final results using the vertical infographic of the respective practical exercise].*

[First and second practice exercise: We will start again and continue with the next exercise. We will repeat the procedures in the next exercise, but my colleague will instruct you to choose a different option from the one we just did. Let me collect the decision forms and hand out a clean version again for the next practice exercise.] **[Third practice exercise:** We have finished the exercises and can now continue.]

Part A - I of the questionnaire (Understanding questions)

[Person B1:] Now that we have finished the practice exercises, I ask you to please answer this short questionnaire that I am giving you. Please do not answer it until I tell you to do so. *[Person B hands out the questionnaires with the heading 'Part A - I'.]* If you need help filling it out or have any questions, please let us know so we can come over and help you. *[Person B reads out each question and answer choice and asks the participant to tick the one they think is correct in the appropriate box].*

With this last question, we have finished the questionnaire. Next, my colleague [Person C] will collect them. *[Person C picks up each of the questionnaires, checks that they are correctly filled in, and marks the participant's identification code on the questionnaire. Finally, she puts them in the envelope where the data is collected].*

Group conversations¹¹

[Person B1 says:]

[Conversation E: Before we start, and for one time only during the activity, you and the other people can meet and chat for a moment. Please form a circle with your chairs around the lake. You can talk about anything related to the activity, such as the rules and instructions and the examples we have discussed during the practice exercises. This is an open conversation about the activity. After the group discussion, you will return to your place and decide individually which farming practices you will use in each growing season. *[Participants have a maximum of 15 minutes to discuss – yet they do not know this time limit. If 10 minutes have passed and there is a prolonged silence or a marked and prolonged deviation from the central topic, person B ends the conversation].*

[For the other types of conversations: In the practice exercises, you and the others could see some possible outcomes that can be achieved in the activity. Now, we invite you to discuss **[Conversation A:** the best possible future; to build a vision of the future you would like to realise] **[Conversation B:** the best possible future] **[Conversation C:** the best possible outcomes you would like to realise and] **[Conversations C and D:** the farming practices you would like to implement] for the lake, yourself and the other people you share it within the activity that follows **[Conversation B:** taking into account a vision of the future proposed by other participants]. **[Conversation A:** First, I will invite you to build this vision mentally. Then, I will ask you to communicate with the others to create a shared group vision].] *[Pause here for a short five-second pause].*

After the discussion, everyone will return to their place and decide individually which farming practices they will implement in each growing season. *[Pause briefly, 5 seconds]*

[Conversation A - D: Consider and situate yourself in this lake you and the others share. Remember that here, you and the others can choose between two farming practices, each generating different gains and impacts on the lake. Remember also that, from one growing season to the next, the water in the lake varies depending on the practices you and others implement. In the end, the value of the lake is shared equally by all who benefit from it. *[Pause here for a long pause of 10 seconds]*

¹¹ A = PVB treatment, B = EV control condition, C = CG control condition, D = P control condition and E = FC control condition

[Conversation A: In that situation, imagine the best possible future you can dream of for the lake you and the others share. Pay attention and follow my voice. I will help you build that image of the future you want to make real. First, I will give you general instructions and then ask more specific questions to help you build that image of the future you want to realise. Please close your eyes if this can help you to imagine that desired future. Or use the blank sheet of paper provided at the beginning to write down or draw what you are imagining. *[Pause briefly for 5 seconds.]*

Imagine a future you and others would like to work towards making a reality. Imagine that it is in your and others' hands the power to make the future you want for yourselves and the lake a reality. Imagine it in detail, as if you were living it right now, and think about what it feels like to be there. *[Read the following questions, pausing for a long time between questions.]*

How do you imagine yourself and others living in that desired future, actively contributing to making it a reality? *[Pause here for a long pause]*

What is the state of the lake? How much water does it hold?

What are your earnings? *[Short pause]* What are the others' earnings?

What farming practices do you implement? *[Short pause]* What farming practices do the others implement?

What do you and others feel living in that desired future? *[Short pause]* How do you think about actively contributing to its realisation and making your dream come true?

Keep this vision you have just imagined in mind so that you can tell others about it.]

[Conversation A—D: Please turn and stand around the lake to start this conversation.]

[Conversation A: The idea is for each person to describe their vision to the group in as much detail as possible and as if they were living it right now. Express your vision when the time comes, and listen carefully to others. You may feel the urge to modify your vision after listening to the visions of others. However, we encourage you not to change it. Use your memory, notes, or drawings to keep your original vision in mind, and express it as vividly as you can and want to when it is your turn. After everyone has expressed their vision, you can talk with others to build a shared group vision from your vision and the vision of others. *[Give the floor to each team member with this instruction: "Visualise again the desired future you have just imagined and tell us what you see." Try to use a maximum of five/ten minutes for this exercise. However, do not interrupt or allow interruptions, ensuring they express their vision entirely. Encourage people not to take the floor to express themselves by asking them directly. Give total freedom to the participants to express themselves. That is, neither force them to translate their vision of the future into terms of the activity (e.g. cards, earnings, farming practices, emotions) nor push for all the expected aspects of the vision (state of the lake, anticipated earnings, farming practices they implement and emotions they feel) to be described by the participants. In other words, any future they express or comment on is valid and sufficient as an individual vision, so move on to the next person as soon as the participant has finished expressing themselves. Once all four people have expressed their vision, do not ask any questions for them to add, deepen, or clarify aspects of their vision, but move on to the next part of the conversation].*

[After each person has expressed their vision, continue with the following:] Thank you for telling your vision and listening to the visions of the other participants. You will now use these individual visions to elaborate a shared vision for the future you want. The idea is that this shared vision describes the best possible future you can dream of, the future you wish (or dream) to see become a reality for the lake and the other people who benefit from it. In general, the shared vision then describes what that future you want looks like and what it feels like to live in and be part of it. For this particular situation that you are in, the shared vision that you build should describe what the state of the lake is, the gains that everyone makes, the farming practices that everyone implements, and what everyone feels in that desired future – seeing it become a reality and contributing to making it a reality daily.]

[Conversation A: To build this shared vision, the] **[Conversation B - D:** The] **[Conversation A - D:** The idea is for each person to speak and express their views on the questions I am going to ask, as well as the opinions of the other participants. This is a conversation among yourselves. I will only guide you with the questions I am going to propose. I will take note of your interventions and use the lake [i.e., the whiteboard where the lake is recreated] to note your perspectives and the emerging conclusions. If there are different positions, we will also make them visible so that everyone can express their preferences or opinions about these (e.g. by voting, if they wish). Are you in agreement with us proceeding in this way? *[Take note of the comments and, if possible, take them into account during the moderation of the conversation].*

[Conversation B: To start the conversation, consider this proposed vision for the lake's future, you, and the others who benefit from it. Others who participated in the activity left this vision. I will represent it here using this infographic while I tell you about it.

In this desired future (by the other participants), *“the lake is always full and maintains its water level, benefiting us and future generations. We all gain equally. The other beneficiaries of the lake and I do crop rotation, grow crops without chemicals, and use water more efficiently in irrigation. Specifically, in the activity, we implement farming practice B, which takes less water from the lake and allows the lake to recharge each season. We are happy, calm, and satisfied to see the lake always full, with the same water level and everyone making the same profit. We are proud to see that we are choosing the agricultural practices that make this desired future a reality.”*

[General guidelines for Person B1 to moderate conversations A - D:

In each of the following sections of questions, read each question and let each participant speak. Start with the general opening question for each question section. First, put all the participants' ideas on the board on white sheets of paper (if possible, with the help of Person C, you can also fill in Template X simultaneously). Then, on the whiteboard, group similar positions or points of view. If a consensus is reached, confirm directly with the group whether there is an agreement (e.g. ‘You suggest that the lake has X amount of water; you choose to practice A or B; your gains are... Do you agree with this opinion or do you suggest any changes?’) Leave only the consensus reached on the board. If no agreement emerges, collect and group the different opinions by affinity and debate them (e.g. ‘I notice that on the one hand, you suggest... and on the other hand, you suggest...’). As a group, which option would you choose?’) If the lack of consensus persists, leave the different opinions expressed – and grouped – on the board. If necessary, ask additional probing questions in each section of questions (e.g. on water quantity and profits) to guide and enrich the content of the conversation around the topic raised by the general opening question. Use additional supporting questions from different angles to lead each participant to express their points as eloquently as possible. (You can be insistent without being unkind or intimidating.) For each additional question, follow the same procedure described above to capture different positions, facilitate consensus, or express dissent. Do not force at this point the translation of what they express into the activity

terms (i.e., in terms of water cards, option A or B farming practices, profits, etc.), but look for consensus and dissent in the participants' terms.

Once you have these consensuses or dissensus, guide participants in translating or connecting these into the terms of the activity. You can use specific questions that put the group back into the context of the activity's hypothetical lake to facilitate this (e.g. 'you have talked about having a lake [in the first section of questions: include desired outcomes for Lake Tota here] in which everyone adopts [in the second section of questions: include the specified type of practices here] to feel [in the third section of questions: include the specified emotions here]. Regarding the hypothetical lake that you will share during the activity, how [for the first section of questions: would you like the lake to look,] [for the second section of questions: what practices would you like to implement] and [for the third section of questions: how would you like to feel?"] The idea is then to use such specific questions for each section of questions. In any case, leave the consensus or dissent expressed at the level of specificity that the group reaches. Do not force the translation of consensus and dissent regarding the activity if the group is reluctant. If they do not specify these in terms of the activity, leave them as such and move on to the next section of questions.

Avoid imposing an agreement or asking for a vote during the conversation. Also, avoid suggesting desirable answers and outcomes and influencing the results. When raising or highlighting possible consensus, do not include elements people have not positioned in the conversation. It is preferable to record different opinions, nuances, and group dynamics (on the board or in Template X and Y, as appropriate). If the group proposes a vote, allow it and record the results.

When starting a new question section, be sure to link the new question section to the consensus or dissent expressed in the previous question sections. In each question section, always follow the same procedure as in the last paragraph. When inconsistencies between the desired results and the proposed actions are noted, make them visible and invite reflection on them, e.g. with the following questions: 'How much are these actions you envision compatible with the future you have just envisioned for yourselves and the lake? How much do the actions you propose contribute to achieving the desired results? If the inconsistency persists, re-emphasise it, elaborate on where it lies, and seek to resolve it by allowing them to change both the outcomes and the actions for this purpose or justify why they do not find it inconsistent.

If someone has not spoken, ask them if they have anything to add. To encourage participation, you can subtly glance at them or gently but directly suggest that they express their opinion.

The idea is to allow participants to discuss freely, draw conclusions as the conversation progresses, and gradually refine the group's responses to each set of questions. The atmosphere should be comfortable, safe for participants to express themselves, and structured enough to guide the conversation toward concrete conclusions. The ultimate goal of this part of the activity is to facilitate a smooth conversation among the people involved according to the guidelines and objectives outlined here.

On the board, leave only confirmed consensus or unresolved dissent displayed. The recording of the final consensus and disagreement reached by the group is done in two ways:

First, Person B1 uses the board to record the visual consensus and dissent. To record, using the terms of the activity, the state of the lake and the farming practices that participants want to implement, Person B1 draws on the water cards and decision formats. Person B1 uses white sheets of paper to record participants' gains and emotions. The formats or white sheets expressing the participants' views are placed in the centre of the board. For example, if four participants agree to adopt farming practice B, Person B1 records this on four decision forms and then places them horizontally side by side in the centre of the board. The same is

done for gains and emotions: Person B1 records the positions of the four participants on four white sheets of paper and places them side by side in the centre of the board horizontally. This procedure is done in the same way for both consensus and dissent.

Second, Person B1 and Person C record the final consensus and disagreement in Template X – in terms of the activity or participants' words if they did not translate them into the activity's terms. In parallel, Person C records other relevant observations in Template Y. If possible, use the participant ID to differentiate their opinions. Person B1, with support from Person C, should always ensure that all the necessary materials are ready before the conversation starts: the whiteboard, an infographic of the model vision for conversation B, decision formats, white sheets, and Templates X and Y.

[The above moderation guidelines follow these general principles:

- Before you begin, ensure each participant understands the exercise instructions. This may require explaining the instructions several times and answering any questions.*
- You should ensure that each participant feels comfortable and safe sharing their views and positions. This can be achieved by setting clear rules and ensuring they are understood.*
- The moderator should ensure enough time for participants to think and reflect before sharing their views.*
- They should also be able to guide the dialogue effectively and express their views and positions clearly and concisely. This may require asking open-ended questions to help each participant express themselves better, using the questions already in the instructions.*
- It is helpful for the moderator to make short summaries of the entire conversation, i.e., to constantly refer back to the different elements being added to the vision of the future, from the individual vision to the one being built collectively.*
- Each participant's participation should be encouraged, ensuring no position is excluded or ignored during the dialogue. This may require asking specific questions to those who seem more reluctant to speak. It is also essential to validate all contributions made by participants positively, thus creating an environment of trust for them.*
- Creativity and innovation could be fostered by encouraging each participant to think of new and different ideas that can help to set and achieve the desired scenario.*
- Ensure that each participant connects with the situation recreated in the activity. This may require reminding participants of the importance of staying focused on the questions posed and the main features of the activity, i.e., the hypothetical shared lake, the possible farming practices, etc.].*

The first section of questions:

General question to open the conversation: Let's start then. [**Conversation A:** Think about that desired future you want to work towards; what does the lake look like?] [**Conversation B:** Considering the desired future described in the vision I have just presented, *[point to the vision in the infographic]* what would you like the lake to look like?] **Specific in-depth questions:** [**Conversation A:** How much water does the lake have? That is, how many water cards are there in the activity? How much does everyone earn?] [**Conversation B:** How much water would you like it to have? That is, in the activity, how many water cards would you like it to have? How much would you want everyone to earn?] [**Conversation C:** How much water do you like the lake to have? That is, in the activity, how many water cards do you want the lake to have? How much do you want each one to earn?].

The second section of questions:

[**Conversation A:** In that desired future,] [**Conversation B:** Again, keep in mind the desired future described in the vision I just presented to you,] [**Conversation C:** To achieve those outcomes,] [**Conversations A - C:** what] [**Conversation D:** What] [**Conversations A - D:** farming practices] [**Conversation A:** do you] [**Conversation B:** would you like to] [**Conversations C and D:** do you want to] [**Conversations A- D:** implement]?

The third section of questions [only for conversations A and B]:

General question to open the conversation: [**Conversation A:** Now imagine you are in that desired future, actively contributing to making it a reality; what do you see, and how does it feel to be there?] [**Conversation B:** Consider the future described in the proposed vision; how would you feel contributing to realising that desired future?] [*Here, you can connect to the specific answers given by the participants in the previous question sections. Instead of referring to the desired or described future in general, you could refer to the concrete content of that vision of the future outlined in the previous question sections.*]
Specific probing questions: [**Conversations A:** *[Pause and note initial responses, if any. Try to observe people directly as the questions are asked]* For example, more specifically, [**Conversation A:** How do they feel] [**Conversation B:** How would they feel] about seeing the lake in the desired state and each person with the desired gains? [**Conversation A:** How do they feel] [**Conversation B:** How would they feel] to see everyone involved choosing the farming practices that contribute to realising the desired future?]

Part A – II of the questionnaire (questions on perceived emotions)

[**Person B1:** Now that we have finished the group discussion, I ask you to sit again with your back on the whiteboard and please answer another short questionnaire. Once the questionnaire is handed out, I will read each question aloud. *[Person B1 goes around handing out the questionnaires with the heading 'Part A - II'.]* Now that everyone has the questionnaire in hand let's get started. Again, if you need help filling it out or have any questions, please let us know so we can come over and help you. *[Person B1 reads out each question and the response options for each possible option, asking to mark the one the participant feels best represents them].*

With this last question, the questionnaire is over. Next, my colleague (Person C) will collect your answers. *[Person C collects each of the questionnaires, checks that they are correctly filled in, marks the participant's identification code on the respective questionnaire, and inserts them in the envelope in which the data is collected].* We will now move on to the main activity.

Basic instructions II - Start of a new growing season

Now, a new growing season starts *[Do not specify the number of each season].*

[**For the first growing season:** From now on, you can freely decide which farming practices you want to implement. Neither my colleague nor I will tell you which decision to make, as this was only the case during the practice exercises. Remember that your choices are private, anonymous, and confidential and will not be known to anyone else. There is no right or wrong decision; based on the information provided, you decide what you prefer.]

[**Person B1, if in the second growing season or later:**] The lake has been refilled with four water cards. *[Person C hands out the decision form and asks each participant to look at the state of the lake.]* You will

then receive the decision form again and can look at the state of the lake. Mark your decision on the paper, fold it, and raise your hand for my colleague to pick it up. You have approximately two minutes to decide.

[While each participant decides, the research team should keep their distance from each participant. Person B1 should stand where it is impossible to see each participant's decisions, e.g. with their back to each participant]. [Person C collects the forms and records the decisions of each participant anonymously and informs Person B how many blue cards to convert to brown. Person B updates the information on the board].

Person B1: My colleague will now give you the voucher with the money earned this season and the flyer with information on how much water the lake has lost this growing season. *[Person C hands out the vouchers and the flyer to each participant and invites everyone to look at the state of the lake.]*

[If there is an upcoming growing season:] This growing season is over. A new growing season will begin *[Returning to the 'Starting a new growing season' section].*

[If seven or fewer water cards are remaining:] The lake has [seven] [less than seven] water cards; it no longer has enough water to sustain agricultural production.

[If the tenth growing season has ended:] This was the last growing season. *[Do not mention the number of the season it ends:]* The activity has ended. We will hand out the survey for you to fill out at your site while we hand out refreshments. Remember that the money you get for your decisions is real money, which we will give you after the survey. *[Pause and suggest that everyone stretch out in their seats before the survey begins.]*

[Participants fill out the individual survey and receive some food and refreshments upon completing it. After that, each participant receives the game's earnings in a sealed envelope. Inside the envelope, they will find a receipt they must fill out, sign, fold and deposit in a ballot box. Once in the room where the donation exercise takes place, each participant is asked to sit where indicated with their back to the rest of the participants and members of the research team. After that, the instructions for the donation task are read out loud.]

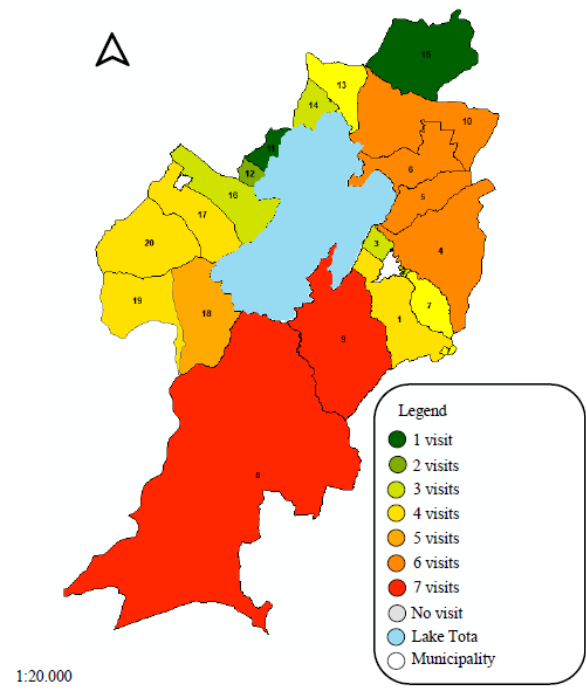
B. Sampling and planning of sessions

B.1 Sampling

We aimed for a sample of 640 subjects (i.e., 160 groups of four persons each) based on sample sizes of other similar lab and lab-in-the-field economic experiments (Cardenas et al., 2013; Andersson et al., 2018; Koessler et al., 2021). We strove for a representative sample of farmers in the Lake Tota area (in Boyacá province, northeast of Colombia) that satisfied our inclusion criteria, i.e. Welsh/long-green onion farm (co-)managers from any of the 21 villages around the lake who use Lake Tota's water as their primary source of irrigation and have not participated in (participatory) programmes to transform farming practices towards increased sustainability. The field research team contacted the farmers directly (i.e., in their workplaces or households) or indirectly. Either way, we counted on the support of a diversified group of trusted community leaders and organisations. When contacted, farmers received general information about the project and, if interested, gave us their contact information and time availability to schedule their participation in an experimental session. We told them the project was about understanding farmers' decisions in territories like Lake Tota's area, and that for the data collection, we relied on small-group meetings comprised of a group activity (i.e., an economic exercise) and an individual survey. Except for the first session, which was held in a different venue, meetings were held in Aquitania, the largest municipality in the area, at the technical school Ramón Ignacio Avella facilities. We told them they could earn an amount in local currency depending on their decisions during the activity that would compensate, on average, their opportunity costs of attending such a meeting (in terms of average transportation costs and daily wage). We also told them that all information we gather will be recorded anonymously and used only for academic purposes. We also informed them that we will disseminate the research project results in 2024.

During our stay in the field, farmers who learned about the project activities from other farmers, farmer associations, their neighbours, friends, relatives, or acquaintances who had or had not participated in the project activities contacted us to participate. We only include those that satisfied the inclusion criteria.

Ultimately, we assembled a registry of 1458 potential participants with their basic information (contact, village of residence, crops' location and primary water source for irrigation, and involvement in any farming association). They were from all the villages around Lake Tota. Yet, villages with more onion production were overrepresented by design as we reached out to farmers from such villages more to ensure more representation of those areas where onion production is predominant according to the most up-to-date agricultural census (DANE 2014). Map 1 shows the number of visits made to pre-register farmers in each village, and Map 2 displays the points where the pre-registration data was collected. Of these 1458 preregistrations, 728 attended the experiment sessions (between 29 June and 5 November 2023), 41 the pilot sessions (between May and June 2023) and 15 the pre-tests (in March 2023). Table B.1 summarises the statistics of the final sample's socioeconomic characteristics.

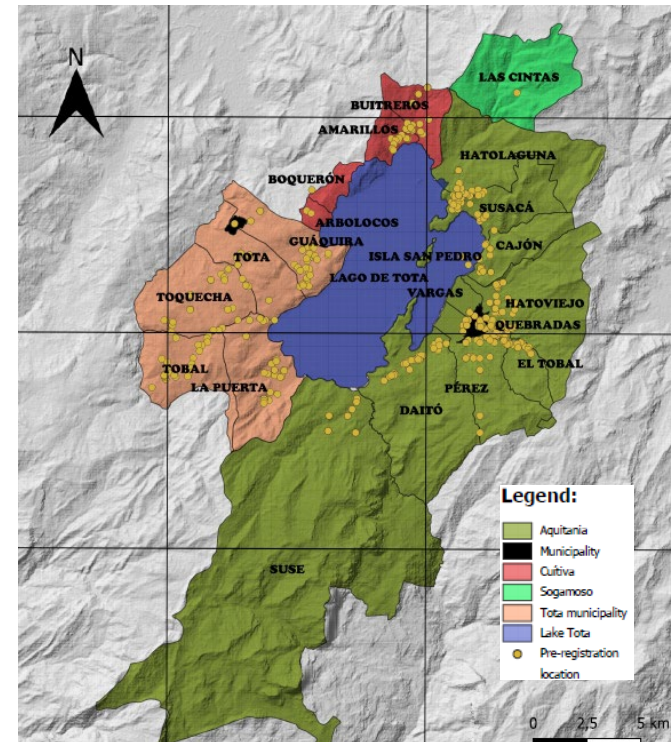


- | | |
|----------------------|------------------|
| 1. Pérez | 11. Boquerón |
| 2. Quebradas | 12. Arbolocos |
| 3. Vargas | 13. Buitreros |
| 4. Hato Viejo | 14. Amarillos |
| 5. El Cajón | 15. Las Cintas |
| 6. Susaca | 16. Guaquira |
| 7. Tobal (Aquitania) | 17. Tota |
| 8. Suce | 18. La Puerta |
| 9. Daito | 19. Tobal (Tota) |
| 10. Hato Laguna | 20. Toquecha |



Map 1 – Number of times each village was visited

Source: IGAC. Elaborated by María Gabriela Barriga-Tobón. The Colombian map in the bottom right shows the location of Boyacá Province, where Lake Tota is. Niapzen Global Terrain and IGAC were the sources for this map, which was elaborated by Juan Carlos Gómez-García.



Map 2 – Location of pre-registration points

Source: Nlapzen Global Terrain and IGAC. Elaborated by Juan Carlos Gómez-García

Table B1 - Summary statistics - Control variables

Variable	PVB	P	CG	EV	Total
	Mean	Mean	Mean	Mean	Mean
	SD	SD	SD	SD	SD
	N	N	N	N	N
Age	44.41	44.09	45.78	45.02	44.84
	15.13	15.09	14.29	14.27	14.69
	180	161	170	168	723
Female	0.44	0.54	0.46	0.40	0.46
<i>(1 = Female, 0 = Male)</i>	0.50	0.50	0.50	0.49	0.50
	179	160	170	167	720
Education level	3.89	3.69	3.96	3.65	3.82
<i>8 ordered categories, from lowest to highest</i>	2.23	2.20	2.23	1.98	2.17
	179	162	171	167	723
Daily income	1.39	1.35	1.42	1.53	1.42
<i>6 ranges of income, from lowest to highest</i>	0.59	0.57	0.76	0.64	0.64
	180	164	170	167	724
Adjusted wealth	0.87	1.05	1.14	0.97	1.00
<i>Value of the land, animal husbandry, livestock, and equipment owned by the participant at local market prices, adjusted by the municipality's average</i>	1.61	1.47	1.84	1.48	1.61
	175	161	161	166	706
Crops	1.67	1.53	1.55	1.74	1.63
<i>Number of crops managed by the participant</i>	1.40	1.16	1.08	1.34	1.26
	180	163	172	167	726
Crops lake	0.46	0.33	0.38	0.60	0.43
<i>Number of managed crops irrigated from the lake</i>	0.79	0.66	0.80	1.03	0.82
	180	164	172	168	728
Other sources of income (outside Lake Tota)	0	0	0	0	0
<i>(1 = if any, 0 = no other sources)</i>	0.13	0.08	0.00	0.13	0.10
	179	162	170	166	721
Other than agrarian income in Lake Tota	0.25	0.32	0.25	0.29	0.28
<i>(1 = any sources of income other than agriculture in Lake Tota, 0 = no other sources)</i>	0.44	0.47	0.44	0.45	0.45
	179	162	170	166	721
Transportation costs	\$ 12,669.49	\$ 9,508.75	\$ 12,439.29	\$ 10,628.31	\$ 11,165.27
<i>Round trip travel costs to the experiment venue (in COP)</i>	\$ 16,631.52	\$ 13,679.66	\$ 16,988.83	\$ 11,837.88	\$ 14,739.09
	177	160	168	166	714
Understanding	0.77	0.83	0.81	0.78	0.79
<i>Fraction of participant's correct answers about the rules of the game</i>	0.21	0.18	0.18	0.21	0.20
	176	160	172	164	716
Facilitator: JC	0.40	0.41	0.49	0.40	0.42
<i>(1 = participant's group facilitator was JC, 0 = another facilitator)</i>	0.49	0.49	0.50	0.49	0.49
	180	164	172	168	728
Facilitator: DR	0.42	0.46	0.33	0.40	0.40
<i>(1 = participant's group facilitator was DR, 0 = another facilitator)</i>	0.50	0.50	0.47	0.49	0.49
	180	164	172	168	728

Facilitator: JJ (1 = participant's group facilitator was JJ, 0 = another facilitator)	0.18 0.38 180	0.12 0.33 164	0.19 0.39 172	0.17 0.37 168	0.17 0.38 728
Information from previous participants (1 = participant received information about the game and research project from a former participant, 0 = other source of information)	0.32 0.47 180	0.38 0.49 164	0.37 0.48 169	0.37 0.48 167	0.35 0.48 723
Acquaintance in the group (1 = participant knows at least one member of the group, 0 = participant knows no one in their group)	0.32 0.47 180	0.46 0.50 164	0.37 0.48 172	0.29 0.45 168	0.37 0.48 728
Previous participatory programmes (1 = participant has participated in a previous programme for agricultural transformation, 0 = no previous participation)	0.43 0.50 180	0.30 0.46 164	0.36 0.48 172	0.36 0.48 168	0.36 0.48 728
Aquitania (1 = Participant came from Aquitania, 0 = Another municipality)	0.82 0.39 177	0.85 0.35 164	0.82 0.38 171	0.80 0.40 168	0.83 0.38 724
Cuítiva (1 = Participant came from Cuítiva, 0 = Another municipality)	0.08 0.27 177	0.03 0.17 164	0.04 0.20 171	0.05 0.21 168	0.05 0.21 724
Sogamoso (1 = Participant came from Sogamoso, 0 = Another municipality)	0.01 0.11 177	0.01 0.11 164	0.01 0.11 171	0.01 0.08 168	0.01 0.10 724
Tota (1 = Participant came from Tota, 0 = Another municipality)	0.09 0.29 177	0.10 0.31 164	0.12 0.33 171	0.15 0.36 168	0.11 0.32 724

B.2 Planning of sessions and groups

Here, we briefly explain how sessions and groups were set up and allocated to the treatment and control conditions. Each session comprised one or two groups of four members, and each group participated in the practice exercises, group conversation, economic game and individual survey in a different classroom. Except for the first session in a different venue, all sessions were conducted in the same three classrooms: one for the general instructions and one of the groups, the other for the other group, and the third one for the donation task.

Each week, the lead author randomly defined the treatments for the two group classrooms before knowing the scheduled potential participants. When there were fewer groups than planned, each week's session plan was (quasi-randomly) adjusted on the go, striving to balance the number of groups by treatment and control across days as much as possible.

In parallel, considering a show-up rate between 50 and 80 per cent, the field research team invited weekly between 10 and 16 potential participants for each session according to the available slots and their

preferred time and date. We strove to have group members who did not know one another and preferably came from different villages and municipalities in the south, east, north, and west of the lake.¹²

If more than eight, or more than four but less than eight potential participants showed up to an experiment session, we selected eight or four, respectively, to form groups of four. Farmers from distant places, rescheduled from previous (cancelled) sessions, or that were difficult to schedule initially, or unfamiliar with the other participants were given priority. The rest of the potential participants had to pick a piece of paper handed out by a field team member. Those with a marked piece of paper left the session, were rescheduled for another session and were compensated for coming in vain. Those without the mark stayed for the session and were organised into groups after delivering the general instructions and before starting the practice exercises.

The allocation of participants to groups was (quasi-) random. We numbered each participant with '1' or '2', varying the numbering order each session. Nevertheless, we did somewhat influence the group composition by seeking a balance of age and sex as often as possible, and participants who knew one another were assigned to different groups.

The group assignment to treatment was random; it did not depend on the participant's characteristics or the group composition, giving each group the same chance to participate in any treatment or control conditions. Upon forming the groups, the group's room allocation alternated so that Group 1 did not always stay in the same room where the general instructions were delivered. Furthermore, as described above, deciding which treatment would be conducted in each room was done beforehand, independently of the group formation process and the participant's and group's characteristics. As Table B.2 illustrates, the distributions of farmers' characteristics are reasonably balanced across treatment and control conditions. Moreover, our results do not vary when controlling for farmers' socioeconomic characteristics (see Table 2 in the main text and the results in Appendix C), suggesting no potential selection biases that could compromise the identification of treatment effects. Table B2 summarises treatment and control groups and sessions.

¹² In setting up the list of potential participants, the treatment and controls assigned to each session were not a consideration. Moreover, the field research team was aware of the differences between each conversation type but unaware of which were the treatment or the control conditions and the specific research questions and hypotheses of the research project.

Table B2 – Treatment and control groups and sessions

Week's starting date	Tuesday - AM *	Tuesday - PM	Wednesday - PM	Thursday - AM*	Thursday - PM	Friday - PM	Saturday - AM	Saturday - PM	Sunday - AM*	Sunday - PM*
1 26/06					D		A			
2 03/07		D	A C		C E	A D	A D			
3 10/07		D A	C C		C C	A	D D D A			
4 17/07		D	C C		A A	D D	C C A			
5 24/07		A	D D		A D	A C	D	C		
6 31/07		A D	A D		A	C	D D C C			
7 07/08		C	A		C C	D	A A C			
8 14/08		C	A D		C	A A	D D E			
9 21/08			A			C C	A A		D	D
10 28/08		D E	D C		C		B B A		A	B
11 04/09		B	B		A B	B C	D B B		B	
12 11/09		A A	A A		B C	E	D C B C			
13 18/09		D	B D			B	D B		B	A
14 25/09		D E	A D		B C	C B	B B C C			
15 02/10		C C	B B		C B	B A	D B E B		B B	E
16 09/10	E	D B	B A	E D	B					
17 16/10		B A	D B		B B	A A	B E D B			
18 23/10		D E	A D		A A	C	B B			
19 30/10		C C	B C		C	B A	A C C B		A	

Letters stand for treatment and control conditions. **A:** Participatory vision-building (PVB), **B:** Exogenous vision (EV), **C:** common goal setting (CG), **D:** Practices (P) and **E:** Free communication (FC). By design, the exogenous vision used in EV was developed based on the visions produced by the first 19 treatment groups (42%) (that explains the late start of the B sessions). We used systematic content analysis techniques to extract the main elements of the participant's visions and use them to draft a typical vision. This vision was the same for all EV groups. Extraordinary sessions (to fit participants' schedules) are marked with an asterisk (*)

C. Data analysis appendix

C.1 Summary statistics for outcome variables

Table C1 – Group cooperation (lake's value index)

Treatment	N	Mean	p25	p50	p75	SD	Min	Max
PVB	45	0.41	0.17	0.35	0.65	0.27	0.04	1.00
P	41	0.33	0.09	0.17	0.57	0.29	0.04	1.00
CG	43	0.42	0.13	0.35	0.74	0.35	0.04	1.00
EV	42	0.36	0.13	0.33	0.52	0.29	0.00	1.00
FC	11	0.31	0.13	0.26	0.52	0.22	0.04	0.65
Total	182	0.38	0.13	0.30	0.57	0.30	0.00	1.00

The lake's value index is the state of the lake resource at the end of the game relative to its maximum level possible if every group member adopted the sustainable farming practice every round. In other words, it indicates what % of the social optimum was achieved. **PVB**: 'Participatory vision-building' treatment, **P**: desirable practices control condition (P), **CG**: common goal setting control condition, **EV**: exogenous vision control condition. **N** stands for sample size, and **P25**, **P50** and **P75** stand for the 25, 50 and 75 percentiles. **SD** indicates the standard deviation

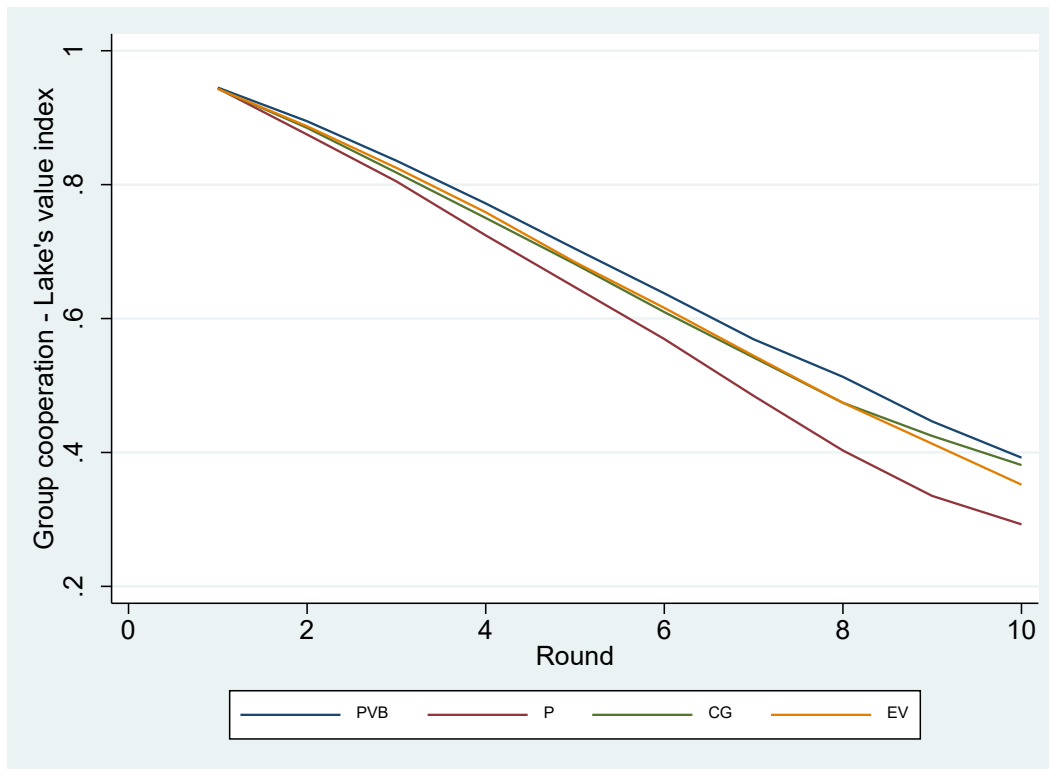


Figure C1 - Change in group cooperation over rounds

The lake's value index is the state of the lake resource at the end of the game relative to its maximum level possible if every group member adopted the sustainable farming practice every round. In other words, it indicates the distance from the social optimum or the percentage of the social optimum that was achieved.

Table C2 – Individual cooperation (Option B farming practices = 1)

Treatment	N	Mean	p25	p50	p75	SD	Min	Max
PVB	180	0.64	0.40	0.70	1.00	0.33	0.00	1.00
P	164	0.56	0.25	0.59	0.90	0.36	0.00	1.00
CG	172	0.61	0.30	0.70	1.00	0.37	0.00	1.00
EV	168	0.61	0.30	0.60	1.00	0.38	0.00	1.00
FC	44	0.59	0.37	0.50	1.00	0.36	0.00	1.00
Total	728	0.60	0.30	0.60	1.00	0.36	0.00	1.00

Here, the mean of the outcome variable indicates the relative frequency in which the sustainable farming practices (i.e. Option B) were adopted. **PVB**: 'Participatory vision-building' treatment, **P**: desirable practices control condition (P), **CG**: common goal setting control condition, **EV**: exogenous vision control condition. **N** stands for sample size, and **P25**, **P50** and **P75** stand for the 25, 50 and 75 percentiles. **SD** indicates the standard deviation

C.2 Complete results of the regression models reported in the main text

Table C3 – Regression analysis for treatment effects

Variables	Group cooperation - Lake's value index		Individual cooperation - Farming practices (Option B=1)	
	Tobit estimations		Logit estimations	
	1A	2A	1B	2B
CG	0.0287 (0.697)	0.0479 (0.475)	-0.107 (0.801)	0.169 (0.677)
EV	-0.0471 (0.468)	-0.0516 (0.425)	-0.128 (0.720)	-0.0820 (0.817)
P	-0.0726 (0.253)	-0.0847 (0.183)	-0.589 (0.107)	-0.425 (0.239)
Age		-0.593** (0.0154)		-2.038*** (0.000139)
Sex		0.161 (0.147)		0.173 (0.489)
Education		0.0334 (0.814)		0.303 (0.440)
Daily income		0.510 (0.265)		1.414 (0.219)
Adjusted wealth		0.319 (0.446)		-0.0348 (0.973)
Crops		0.319 (0.423)		2.190** (0.0418)
Crops lake		-0.0322 (0.920)		-0.584 (0.418)
Other than agriculture in LT		0.151 (0.144)		0.263 (0.287)
Transport costs		-0.885** (0.0125)		-2.522** (0.0386)
Understanding		0.0326		-0.00200

		(0.905)		(0.997)
JC		-0.0947		-0.540
		(0.147)		(0.170)
DR		-0.125*		-0.690*
		(0.0637)		(0.0799)
Info by previous participant		-0.258**		-0.999***
		(0.0149)		(0.000295)
Acquaintance		-0.0601		0.395
		(0.464)		(0.129)
Previous participatory programmes		-0.0359		0.128
		(0.696)		(0.612)
Cuítiva		0.317		1.263**
		(0.185)		(0.0123)
Sogamoso		1.360***		3.739***
		(0.00975)		(0.00406)
Tota		-0.0199		-0.350
		(0.905)		(0.390)
Constant	0.413***	0.667**	1.179***	2.163***
	(0)	(0.0260)	(9.29e-07)	(0.00409)
Observations	171 Groups	171 Groups	6,447 (684 individuals)	5,796 (613 individuals)

Panel A presents the results of Tobit models estimated assuming lower and upper censoring and calculating robust standard errors. Panel B presents the results of logit models calculating robust standard errors clustered at the group level. P-values are in brackets (** p-value < 0.01, * p-value < 0.05 and * p<0.1). The dependent variable in Panel A, the lake's value index, is the value of the lake resource at the end of the game relative to its maximum level possible, i.e. it indicates what proportion of the social optimum was achieved. In Panel B, the dependent variable is the farming practice adopted by a participant in a given round (= 1 if the sustainable farming practice was adopted; 0 otherwise). The entire sample included groups assigned to PVB, P, CG and EV. PVB was used as the base category in these regressions to show the comparative results.

C.3 Robustness checks

Table C4 – Regression analysis of treatment effects excluding those who knew about the activity from previous participants

Variables	Group cooperation - Lake's value index		Individual cooperation - Farming practices (Option B=1)	
	Tobit estimations		Logit estimations	
	1A	2A	1B	2B
CG	0.0149	0.0209	-0.318	-0.293
	(0.843)	(0.782)	(0.495)	(0.521)
EV	-0.0585	-0.0827	-0.464	-0.492
	(0.375)	(0.286)	(0.282)	(0.246)
P	-0.0683	-0.0630	-0.428	-0.230
	(0.296)	(0.378)	(0.286)	(0.592)
Age		-0.376**		-1.945***

		(0.0179)		(0.00360)
Sex		0.0382		0.0202
		(0.626)		(0.945)
Education		0.0412		0.273
		(0.724)		(0.543)
Daily income		0.337		1.275
		(0.351)		(0.354)
Adjusted wealth		-0.0910		0.451
		(0.735)		(0.725)
Crops		0.298		1.831
		(0.485)		(0.142)
Crops lake		-0.00797		-0.573
		(0.973)		(0.503)
Other than agriculture in LT		0.0653		0.219
		(0.430)		(0.452)
Transport costs		-0.549**		-1.886
		(0.0115)		(0.108)
Understanding		-0.00941		-0.531
		(0.959)		(0.473)
JC		-0.146**		-0.676
		(0.0414)		(0.121)
DR		-0.171**		-0.416
		(0.0167)		(0.329)
Acquaintance		0.00377		0.204
		(0.960)		(0.484)
Previous participatory programmes		-0.0579		0.0186
		(0.430)		(0.951)
Cuítiva		0.200		0.977*
		(0.219)		(0.0758)
Sogamoso		0.456**		3.046
		(0.0377)		(0.105)
Tota		0.0952		-0.476
		(0.388)		(0.294)
Constant	0.419***	0.649***	1.586***	2.812***
	(0)	(0.00108)	(1.55e-10)	(0.00143)
Observations	164 groups	163 groups	4,168 (437 individuals)	3,783 (396 individuals)

Panel A presents the results of Tobit models estimated assuming lower and upper censoring and calculating robust standard errors. Panel B presents the results of logit models calculating robust standard errors clustered at the group level. P-values are in brackets (***) p-value < 0.01, ** p-value < 0.05 and * p<0.1). The dependent variable in Panel A, the lake's value index, is the value of the lake resource at the end of the game relative to its maximum level possible, i.e. it indicates what proportion of the social optimum was achieved. In Panel B, the dependent variable is the farming practice adopted by a participant in a given round (= 1 if the sustainable farming practice was adopted; 0 otherwise). The entire sample included groups assigned to PVB, P, CG and EV. PVB was used as the base category in these regressions to show the comparative results.

Table C5 – Regression analysis of treatment effects excluding those who had participated in previous participatory programmes for transformation of production in agriculture

Variables	Group cooperation - Lake's value index		Individual cooperation - Farming practices (Option B=1)	
	Tobit estimations		Logit estimations	
	1A	2A	1B	2B
CG	0.0526 (0.489)	0.112 (0.136)	0.276 (0.580)	0.485 (0.328)
EV	-0.0460 (0.488)	-0.0647 (0.294)	-0.110 (0.805)	-0.183 (0.682)
P	-0.0665 (0.300)	-0.0592 (0.338)	-0.409 (0.358)	-0.334 (0.452)
Age		-0.586*** (0.000522)		-3.181*** (3.11e-07)
Sex		0.0305 (0.701)		0.206 (0.493)
Education		-0.237* (0.0998)		-0.00224 (0.997)
Daily income		0.326 (0.367)		1.446 (0.381)
Adjusted wealth		-0.257 (0.434)		-1.353 (0.247)
Crops		0.604** (0.0412)		3.292** (0.0291)
Crops lake		0.394 (0.185)		0.221 (0.853)
Other than agriculture in LT		0.134* (0.0568)		0.103 (0.746)
Transport costs		-0.730** (0.0214)		-2.555 (0.114)
Understanding		-0.116 (0.536)		-0.446 (0.555)
JC		-0.0850 (0.236)		-0.716* (0.0960)
DR		-0.0919 (0.160)		-0.681* (0.0928)
Info by previous participant		-0.218*** (0.00631)		-1.181*** (0.000422)
Acquaintance		0.0117 (0.871)		0.550* (0.0980)
Cuítiva		0.324* (0.0712)		0.870 (0.257)

Sogamoso		0.704 (0.394)		1.104 (0.499)
Tota		-0.0338 (0.775)		-0.304 (0.571)
Constant	0.406*** (0)	0.847*** (5.85e-05)	0.924*** (0.00311)	3.051*** (0.000413)
Observations	166 groups	162 groups	4,089 observations 434 individuals	3,662 observations 388 individuals

Panel A presents the results of Tobit models estimated assuming lower and upper censoring and calculating robust standard errors. Panel B presents the results of logit models calculating robust standard errors clustered at the group level. P-values are in brackets (** p-value < 0.01, * p-value < 0.05 and * p < 0.1). The dependent variable in Panel A, the lake's value index, is the value of the lake resource at the end of the game relative to its maximum level possible, i.e. it indicates what proportion of the social optimum was achieved. In Panel B, the dependent variable is the farming practice adopted by a participant in a given round (= 1 if the sustainable farming practice was adopted; 0 otherwise). The entire sample included groups assigned to PVB, P, CG and EV. PVB was used as the base category in these regressions to show the comparative results.

Table C6 – Regression analysis of treatment effects excluding those who were in groups whose session had implementation defects.

Variables	Group cooperation - Lake's value index		Individual cooperation - Farming practices (Option B=1)	
	Tobit estimations		Logit estimations	
	1A	2A	1B	2B
CG	0.00678 (0.928)	0.0300 (0.677)	-0.169 (0.698)	0.127 (0.766)
EV	-0.0548 (0.420)	-0.0627 (0.341)	-0.162 (0.665)	-0.108 (0.766)
P	-0.0727 (0.273)	-0.0880 (0.178)	-0.520 (0.168)	-0.378 (0.310)
Age		-0.512** (0.0426)		-1.994*** (0.000228)
Sex		0.173 (0.132)		0.249 (0.321)
Education		0.0507 (0.727)		0.380 (0.351)
Daily income		0.617 (0.177)		1.535 (0.191)
Adjusted wealth		0.370 (0.367)		0.771 (0.379)
Crops		0.318 (0.444)		2.462** (0.0253)
Crops lake		-0.167		-0.828

		(0.615)		(0.269)
Other than agriculture in LT		0.134		0.188
		(0.221)		(0.455)
Transport costs		-0.887**		-2.211*
		(0.0151)		(0.0743)
Understanding		0.0965		0.0941
		(0.723)		(0.883)
JC		-0.0903		-0.506
		(0.186)		(0.201)
DR		-0.0765		-0.465
		(0.262)		(0.242)
Info by previous participant		-0.250**		-0.982***
		(0.0251)		(0.000569)
Acquaintance		-0.0797		0.363
		(0.346)		(0.180)
Previous participatory programmes		-0.00311		0.0765
		(0.973)		(0.772)
Cuítiva		0.272		1.245**
		(0.264)		(0.0149)
Sogamoso		1.571***		3.598***
		(0.00345)		(0.00547)
Tota		0.00630		-0.332
		(0.972)		(0.414)
Constant	0.424***	0.557*	1.216***	1.837**
	(0)	(0.0769)	(1.86e-06)	(0.0135)
Observations	159	159	6,007	5,435
	Groups	Groups	individuals)	(574 individuals)

Panel A presents the results of Tobit models estimated assuming lower and upper censoring and calculating robust standard errors. Panel B presents the results of logit models calculating robust standard errors clustered at the group level. P-values are in brackets (***) p-value < 0.01, ** p-value < 0.05 and * p<0.1). The dependent variable in Panel A, the lake's value index, is the value of the lake resource at the end of the game relative to its maximum level possible, i.e. it indicates what proportion of the social optimum was achieved. In Panel B, the dependent variable is the farming practice adopted by a participant in a given round (= 1 if the sustainable farming practice was adopted; 0 otherwise). The entire sample included groups assigned to PVB, P, CG and EV. PVB was used as the base category in these regressions to show the comparative results.

Table C7—Regression analysis of treatment effects excluding those groups with participants who struggled to understand the activity during the session.

Variables	Group cooperation - Lake's value index		Individual cooperation - Farming practices (Option B=1)	
	Tobit estimations		Logit estimations	
	1A	2A	1B	2B
CG	0.0285 (0.699)	0.0509 (0.451)	-0.108 (0.797)	0.176 (0.661)
EV	-0.0710 (0.298)	-0.0794 (0.237)	-0.240 (0.519)	-0.193 (0.603)
P	-0.0803 (0.203)	-0.0899 (0.161)	-0.625* (0.0873)	-0.485 (0.181)
Age		-0.626** (0.0113)		-1.960*** (0.000364)
Sex		0.125 (0.262)		0.123 (0.637)
Education		0.0702 (0.629)		0.398 (0.325)
Daily income		0.384 (0.413)		0.948 (0.403)
Adjusted wealth		0.547 (0.203)		0.228 (0.823)
Crops		0.274 (0.494)		2.058* (0.0553)
Crops lake		0.0704 (0.830)		-0.198 (0.793)
Other than agriculture in LT		0.110 (0.274)		0.218 (0.380)
Transport costs		-1.100*** (0.00149)		-2.629** (0.0377)
Understanding		-0.0272 (0.922)		0.105 (0.867)
JC		-0.0957 (0.143)		-0.549 (0.153)
DR		-0.0759 (0.237)		-0.485 (0.210)
Info by previous participant		-0.227** (0.0352)		-0.970*** (0.000536)
Acquaintance		-0.0784 (0.350)		0.432 (0.105)
Previous participatory programmes		-0.0510		0.123

		(0.583)		(0.631)
Cuítiva		0.438*		1.481***
		(0.0773)		(0.00424)
Sogamoso		1.467***		3.772***
		(0.00610)		(0.00353)
Tota		0.0481		-0.218
		(0.776)		(0.599)
Constant	0.412***	0.719**	1.165***	1.917**
	(0)	(0.0166)	(1.03e-06)	(0.0118)
Observations	162	162	6,099	5,495
	Groups	Groups	(648 individuals)	(582 individuals)

Panel A presents the results of Tobit models estimated assuming lower and upper censoring and calculating robust standard errors. Panel B presents the results of logit models calculating robust standard errors clustered at the group level. P-values are in brackets (***) p-value < 0.01, ** p-value < 0.05 and * p<0.1). The dependent variable in Panel A, the lake's value index, is the value of the lake resource at the end of the game relative to its maximum level possible, i.e. it indicates what proportion of the social optimum was achieved. In Panel B, the dependent variable is the farming practice adopted by a participant in a given round (= 1 if the sustainable farming practice was adopted; 0 otherwise). The entire sample included groups assigned to PVB, P, CG and EV. PVB was used as the base category in these regressions to show the comparative results.

C4. Exploratory analysis of potential treatment effects on secondary outcomes.

Table C8 – Regression analysis of potential treatment effects on the participant’s perceived emotions

Variables	Inspiration		Sadness		Frustration		Happiness		Optimism	
	Ordered probit estimations									
	1A	2A	1B	2B	1C	2C	1D	2D	1E	2E
CG	-0.295** (0.0191)	-0.257* (0.0666)	-0.352** (0.0189)	-0.531*** (0.000782)	-0.403*** (0.00584)	-0.535*** (0.000479)	-0.0674 (0.553)	-0.0688 (0.558)	-0.215* (0.0672)	-0.188 (0.159)
EV	0.0829 (0.532)	0.168 (0.229)	-0.314** (0.0388)	-0.398** (0.0102)	-0.529*** (0.00136)	-0.587*** (0.000397)	0.118 (0.306)	0.0963 (0.381)	-0.0361 (0.765)	0.0263 (0.827)
P	-0.284** (0.0228)	-0.302** (0.0312)	-0.167 (0.219)	-0.246 (0.104)	-0.140 (0.349)	-0.150 (0.360)	-0.218* (0.0862)	-0.228* (0.0725)	-0.137 (0.280)	-0.110 (0.440)
Age		-0.00821 (0.974)		0.0839 (0.698)		0.584*** (0.00624)		0.451** (0.0386)		-0.371 (0.135)
Sex		0.307*** (0.00100)		0.0102 (0.934)		-0.118 (0.365)		-0.0931 (0.348)		0.191* (0.0668)
Education		-0.0333 (0.822)		0.169 (0.336)		0.314** (0.0283)		-0.168 (0.281)		-0.187 (0.158)
Daily income		-0.373 (0.389)		-0.155 (0.744)		-0.545 (0.161)		0.0815 (0.823)		-0.584 (0.125)
Adjusted wealth		0.508 (0.234)		-0.153 (0.776)		0.0391 (0.931)		-0.269 (0.500)		0.946** (0.0340)
Crops		0.730** (0.0463)		-0.384 (0.459)		-0.210 (0.666)		0.440 (0.230)		0.654 (0.135)
Crops lake		0.290 (0.298)		0.404 (0.246)		0.165 (0.668)		-0.0657 (0.796)		0.147 (0.605)
Other than agriculture in LT		-0.0998 (0.329)		-0.0580 (0.642)		0.103 (0.361)		-0.138 (0.162)		-0.0497 (0.617)
Transport costs		0.949** (0.0121)		-0.670 (0.221)		0.477 (0.289)		0.0987 (0.805)		0.341 (0.348)
Understanding		0.182 (0.489)		-0.421 (0.166)		-0.177 (0.552)		-0.119 (0.631)		-0.134 (0.586)

JC	0.125 (0.345)	-0.313** (0.0219)	-0.159 (0.304)	0.0992 (0.413)	0.0728 (0.572)					
DR	-0.0238 (0.860)	-0.337** (0.0290)	-0.340** (0.0266)	0.0908 (0.463)	-0.00181 (0.988)					
Info by previous participant	-0.120 (0.238)	-0.0810 (0.512)	0.0956 (0.394)	-0.00147 (0.989)	0.0157 (0.868)					
Acquaintance	0.148 (0.122)	0.0510 (0.666)	0.108 (0.356)	0.00383 (0.968)	0.0632 (0.503)					
Previous participatory programmes	0.187* (0.0597)	-0.182 (0.106)	-0.128 (0.243)	0.107 (0.258)	0.237*** (0.00980)					
Cúitiva	-0.0917 (0.715)	-0.0807 (0.746)	0.212 (0.295)	-0.0362 (0.862)	0.0131 (0.954)					
Sogamoso	-0.216 (0.649)	0.429 (0.548)	-0.0799 (0.911)	-0.550 (0.256)	-0.202 (0.638)					
Tota	-0.209 (0.262)	0.0589 (0.793)	0.314* (0.0677)	0.0153 (0.929)	-0.398** (0.0119)					
Observations (individuals)	682	612	683	612	681	611	683	613	684	613

Ordered probit models by emotion as a dependent variable were estimated. Each emotion perception was measured using a Likert scale with four categories (e.g. “no inspired at all”, “somewhat inspired”, “inspired”, and “very inspired”) through an individual questionnaire after the group conversation and before the game. Robust standard errors were estimated, and p-values are in brackets (***) p<0.01, ** p<0.05, * p<0.1). The entire sample included groups assigned to PVB, P, CG and EV. PVB was used as the base category in these regressions to show the comparative results.

Table C9 – Regression analysis of treatment effects on individual and group cooperation, controlling for round effects

Variables	Group cooperation - Lake's value index		Individual cooperation - Farming practices (Option B=1)	
	Tobit estimations		Logit estimations	
	1A	2A	1B	2B
CG	-0.0309 (0.272)	-0.00978 (0.767)	0.0455 (0.924)	0.397 (0.379)
EV	0.00653 (0.784)	0.00253 (0.929)	0.203 (0.632)	0.297 (0.472)
P	-0.0194 (0.413)	-0.0221 (0.456)	-0.380 (0.353)	-0.0817 (0.839)
Round	-0.0590*** (0)	-0.0605*** (0)	-0.0720*** (0.00509)	-0.0589** (0.0203)
CG*Round	0.0101 (0.173)	0.00849 (0.240)	-0.0326 (0.371)	-0.0447 (0.226)
EV*Round	-0.00355 (0.550)	-0.00271 (0.642)	-0.0610 (0.118)	-0.0700* (0.0758)
P*Round	-0.00407 (0.551)	-0.00447 (0.512)	-0.0459 (0.226)	-0.0703* (0.0659)
Age		-0.379** (0.0132)		-2.076*** (0.000162)
Sex		0.0955 (0.165)		0.170 (0.507)
Education		0.0444 (0.620)		0.317 (0.432)
Daily income		0.342 (0.232)		1.463 (0.216)
Adjusted wealth		0.162 (0.551)		-0.0475 (0.964)
Crops		0.207 (0.416)		2.256** (0.0416)
Crops lake		0.00948 (0.958)		-0.619 (0.403)
Other than agriculture in LT		0.0818 (0.222)		0.276 (0.276)
Transport costs		-0.575** (0.0115)		-2.648** (0.0346)
Understanding		0.0327 (0.850)		0.0205 (0.975)
JC		-0.0693 (0.106)		-0.734* (0.0716)
DR		-0.0527 (0.196)		-0.571 (0.160)

Info by previous participant		-0.178*** (0.00908)		-1.031*** (0.000298)
Acquaintance		-0.0342 (0.502)		0.402 (0.135)
Previous participatory programmes		-0.0295 (0.617)		0.133 (0.610)
Cuítiva		0.238* (0.0980)		1.302** (0.0116)
Sogamoso		0.822*** (0.00903)		3.864*** (0.00373)
Tota		-0.0211 (0.835)		-0.351 (0.403)
Constant	1.017*** (0)	1.170*** (3.05e-09)	1.590*** (2.29e-08)	2.527*** (0.00178)
Observations	1,612 171 groups	1,612 171 groups	6,447 684 individuals	5,796 613 individuals

Panel A presents the results of Tobit models estimated assuming lower and upper censoring and calculating robust standard errors. Panel B presents the results of logit models calculating robust standard errors clustered at the group level. P-values are in brackets (***) p-value < 0.01, ** p-value < 0.05 and * p<0.1). The dependent variable in Panel A, the lake's value index, is the value of the lake resource at the end of the game relative to its maximum level possible, i.e. it indicates what proportion of the social optimum was achieved. In Panel B, the dependent variable is the farming practice adopted by a participant in a given round (= 1 if the sustainable farming practice was adopted; 0 otherwise). The entire sample included groups assigned to PVB, P, CG and EV. PVB was used as the base category in these regressions to show the comparative results.

Table C10 - Regression analysis of potential treatment effects on reported beliefs

Variables	First order beliefs (1 = Participant reports having expected others to Option B throughout the game)		Second order beliefs (1 = Participant reports having expected others to expect them to Option B throughout the game)	
	Logit estimations			
	1A	1B	2A	2B
CG	-0.258 (0.254)	-0.122 (0.616)	-0.0131 (0.952)	0.103 (0.688)
EV	0.0944 (0.671)	0.0190 (0.938)	0.134 (0.544)	0.131 (0.590)
P	0.0319 (0.887)	0.171 (0.485)	0.0144 (0.949)	0.154 (0.567)
Age		-0.617 (0.117)		-0.402 (0.336)
Sex		-0.232 (0.225)		0.124 (0.494)
Education		0.0385 (0.884)		-0.461 (0.118)
Daily income		-0.583 (0.436)		0.124 (0.867)

Adjusted wealth		0.200 (0.799)		-0.186 (0.831)
Crops		-1.383* (0.0663)		0.295 (0.736)
Crops lake		0.783 (0.182)		0.545 (0.363)
Other than agriculture in LT		-0.183 (0.362)		0.137 (0.541)
Transport costs		0.319 (0.669)		2.341*** (0.00649)
Understanding		-0.118 (0.806)		0.179 (0.737)
JC		-0.389 (0.144)		-0.0550 (0.834)
DR		-0.507* (0.0604)		-0.0960 (0.730)
Info by previous participant		-0.502*** (0.00860)		-0.352* (0.0698)
Acquaintance		-0.296 (0.128)		-0.278 (0.162)
Previous participatory programmes		-0.108 (0.519)		0.0231 (0.906)
Cuítiva		0.182 (0.623)		-0.127 (0.755)
Sogamoso		1.498 (0.199)		
Tota		-0.613** (0.0441)		-0.501* (0.0712)
Constant	0.281* (0.0722)	1.702*** (0.00207)	0.577*** (3.61e-05)	0.683 (0.264)
Observations (Individuals)	679	608	676	600

Outcome variables are the beliefs about others' likely cooperation and expected cooperation after the group conversation and before the game. (These beliefs were elicited through the individual survey after the game.) Robust standard errors clustered at the group level were estimated. P-values are in brackets (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The entire sample included groups assigned to PVB, P, CG and EV. PVB was used as the base category in these regressions to show the comparative results.

Table C11 - Regression analysis of potential treatment effects on environmental preferences

Variables	Level of agreement (1-5) with the statement, "The community can only progress if it conserves the environment (e.g., by taking care of the forest and water sources)."		Level of agreement (1-5) with the statement, "You can only improve your economic situation if you conserve the environment (e.g. by taking care of the forest and water sources)."		Level of agreement (1-5) with the statement, "The lake is valuable regardless of the economic activities it allows. For this reason, it must be protected."	
	Ordered probit estimations					
	1A	2A	1B	2B	1C	2C
CG	0.00841 (0.954)	-0.0585 (0.694)	0.219 (0.172)	0.236 (0.152)	-0.0611 (0.677)	-0.00288 (0.985)
EV	-0.0883 (0.529)	-0.143 (0.309)	0.141 (0.288)	0.123 (0.375)	-0.205 (0.113)	-0.232* (0.0731)
P	0.0675 (0.657)	0.0525 (0.755)	0.207 (0.230)	0.189 (0.316)	-0.142 (0.366)	-0.224 (0.174)
Age		-0.318 (0.250)		-0.144 (0.544)		-0.107 (0.665)
Sex		0.125 (0.263)		0.205* (0.0748)		0.166 (0.149)
Education		0.102 (0.582)		0.143 (0.456)		0.193 (0.323)
Daily income		0.168 (0.736)		0.753* (0.0950)		0.395 (0.297)
Adjusted wealth		0.225 (0.581)		0.345 (0.408)		-0.399 (0.357)
Crops		1.052* (0.0542)		0.346 (0.500)		0.194 (0.663)
Crops lake		-0.369 (0.330)		0.208 (0.497)		0.167 (0.630)
Other than agriculture in LT		-0.0814 (0.510)		-0.241* (0.0553)		0.00298 (0.980)
Transport costs		-0.168 (0.760)		0.0977 (0.821)		-0.741* (0.0807)
Understanding		0.590** (0.0323)		0.491* (0.0880)		0.362 (0.261)
JC		-0.438*** (0.00117)		-0.211 (0.118)		-0.217 (0.114)
DR		-0.184 (0.201)		-0.126 (0.371)		-0.178 (0.204)
Info by previous participant		0.0157 (0.888)		-0.226** (0.0374)		-0.170 (0.129)
Acquaintance		0.114		0.197*		0.198*

	(0.338)	(0.0928)	(0.0722)
Previous participatory programmes	-0.0539 (0.616)	-0.0900 (0.403)	0.0705 (0.539)
Cuítiva	0.0233 (0.917)	0.0635 (0.786)	0.187 (0.404)
Sogamoso	0.746 (0.202)	0.495 (0.434)	0.965 (0.115)
Tota	0.151 (0.426)	0.00348 (0.982)	-0.0747 (0.631)
Observations	556	510	555
		509	554
			508

Ordered probit models were estimated, and robust standard errors were calculated. P-values are in brackets (***) p<0.01, ** p<0.05, * p<0.1.) The entire sample included groups assigned to PVB, P, CG, and EV. PVB was used as the base category in these regressions to show the comparative results.

Table C12 – Fraction of earnings donated to the agroecological fair (Summary statistics)

Treatment	N	Mean	p25	p50	p75	SD	Min	Max
PVB	126	0.100	0.035	0.072	0.127	0.112	0.000	0.595
P	102	0.076	0.032	0.070	0.100	0.053	0.000	0.208
CG	128	0.078	0.026	0.049	0.098	0.088	0.000	0.600
EV	167	0.075	0.028	0.059	0.091	0.077	0.000	0.493
Total	563	0.082	0.030	0.062	0.099	0.086	0.000	0.600

PVB: ‘Participatory vision-building’ treatment, **P:** desirable practices control condition (P), **CG:** common goal setting control condition, **EV:** exogenous vision control condition. **N** stands for sample size, and **P25**, **P50** and **P75** stand for the 25, 50 and 75 percentiles. **SD** indicates the standard deviation

Table C13 - Regression analysis of potential treatment effects on preferences for pro-social action

Variables	Donations (fraction of earnings)	
	Tobit estimations	
	1A	2A
CG	-0.0233* (0.0835)	-0.0187 (0.154)
EV	-0.0276** (0.0278)	-0.0256** (0.0359)
P	-0.0219* (0.0646)	-0.0112 (0.316)
Age		0.0592*** (0.000731)
Sex		-0.00785 (0.371)
Education		0.0283** (0.0467)
Daily income		0.00219

		(0.952)
Adjusted wealth		0.000456
		(0.987)
Crops		0.0468
		(0.304)
Crops lake		0.00572
		(0.851)
Other than agriculture in LT		0.0118
		(0.180)
Transport costs		-0.0916***
		(0.00170)
Understanding		-0.0545**
		(0.0325)
JC		-0.00606
		(0.582)
DR		-0.0124
		(0.253)
Info by previous participant		-0.0203**
		(0.0216)
Acquaintance		-0.00548
		(0.509)
Previous participatory programmes		0.0231**
		(0.0188)
Cuítiva		0.0175
		(0.395)
Sogamoso		0.00514
		(0.879)
Tota		-0.0166
		(0.152)
Constant	0.0963***	0.111***
	(0)	(0.000142)
Observations	523	481
(Individuals)		

Tobit models assuming upper and lower censoring were estimated, calculating robust standard errors. P-values are in bracket (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The entire sample included groups assigned to PVB, P, CG, and EV. PVB was used as the base category in these regressions to show the comparative results.