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When Needs Change Norms: Experimental Evidence that Income Shocks Undermine Norm-Driven Cooperation in Forest Commons

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When needs change norms: Experimental evidence that income shocks undermine norm-driven cooperation in forest commons

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Abstract: Forest protection contributes to climate change mitigation and biodiversity conservation. Yet negative income shocks can induce local forest users to increase extraction in order to cope with economic hardship. We study how social norms shape collaborative forest management when communities face an exogenous income shock. We implement an incentivized framed field experiment with 162 smallholder farmers in rural Ethiopia using an interactive dynamic resource extraction game. Farmers individually decide how many trees to harvest from a community forest: harvested trees yield private income, whereas unharvested trees generate group benefits. They do so under different experimental treatments—either with or without i) the presence of a negative income shock and ii) a previous activation of social norms—allowing us to causally identify mechanisms shaping forest management. We find that the activation of social norms fosters fully sustainable resource management in the absence of an income shock. Moreover, a different norm emerges when the community encounters an income shock: now, harvesting more than can sustainably regrow is considered socially appropriate and harvesting behavior adjusts accordingly. Yet without norm activation, the negative income shock puts even more pressure on deforestation. Taken together, these findings suggest that policy-makers should work with local communities to develop complementary institutional mechanisms that sustain collective forest management in times of crisis.

JEL classification codes: Q20, Q23, Q50, Q56, D70, D91, D64, Z13.

Keywords: Common-pool resources, forest commons, social norms, income shock, framed field experiment, community forest management, cooperation

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1 Introduction

Sustainable forest management is a promising pathway to simultaneously mitigate climate change and conserve biodiversity (IPBES, 2019; IPCC, 2023; Fischer et al., 2023). Yet, collective action in forest management is notoriously difficult to achieve because of the tragedy of the commons (Hardin, 1968). Community-based natural resource management can overcome such collective action dilemmas under favorable local conditions (Ostrom, 1990; Busch & Ferretti-Gallon, 2023). However, forest-dependent communities are particularly vulnerable to economic crises—including those exacerbated by climate change (IPCC, 2023; Ngcamu, 2023)—and environmental uncertainty can jeopardize collective conservation efforts (Mantilla, 2018). Despite the centrality of shocks and uncertainty for forest users, we still know relatively little about the behavioral mechanisms through which crises shape cooperation in local forest governance.

A prominent and unprecedented recent economic crisis was the COVID-19 pandemic. The pandemic likely affected collective forest management initiatives especially in the Global South by interrupting external income flows (Wunder et al., 2021) and thereby increasing reliance on forests as an economic safety net (Wunder et al., 2014). Consistent with this conjecture, spatial evidence documents increases in deforestation (Brancalion et al., 2020; Fiestas-Flores et al., 2025) and wildfires (Amador-Jiménez et al., 2020; Eklund et al., 2022) during the COVID-19 pandemic compared to pre-pandemic levels, with particularly pronounced trends across parts of the African continent (Kganyago & Shikwambana, 2021; Céspedes et al., 2023).

This paper i) investigates behavioral mechanisms of forest use in times of crisis and ii) causally examines the role that social norms have in shaping extraction decisions under such conditions. We conducted a framed field experiment (Harrison & List, 2004) with a sample of 162 smallholder farmers from rural Ethiopia who regularly engage in forest management. In this game, participants play a resource extraction game framed around a community forest. They govern the forest under two scenarios: a No-shock scenario, in which farmers receive an alternative income source that covers basic living costs, and a Shock scenario, in which this alternative income source is absent. Each scenario consists of five rounds in which each farmer independently chooses how many trees to harvest from the community forest to generate private earnings. Any trees remaining at the end of a scenario generate a group payoff, creating a social dilemma analogous to the tragedy of the commons. We find that the introduction of this exogenous income shock increases forest stock depletion: across all groups, the remaining forest stock is, on average, about 10.5% lower at the end of the game in the Shock scenario than in the No-shock scenario. This experimental evidence supports the conjecture that crises such as the COVID-19 pandemic can increase pressure on forest resources (Brancalion et al., 2020; Céspedes et al., 2023; Fiestas-Flores et al., 2025).

Social norms are widely viewed as a key mechanism supporting successful community-based natural resource management (Ostrom, 1990, 2000a, 2000b). Following Ostrom (2000a, p. 143f), we define social norms as "shared understandings about actions that are obligatory, permitted, or forbidden." In forest user communities, such norms may limit harvesting to (approximately) the natural regrowth rate, thereby sustaining benefits for future generations.

To test the role of social norms in times of crisis, we randomly assigned half of the experimental groups to a Norm condition and the other half to a No-norm condition. In the Norm condition, participants received a norm-activation intervention: after having listened to an audio recording in which local community members discuss the importance of sustainably managing their forest before the start of the No-shock scenario, we elicited farmers' normative beliefs (Cialdini et al., 1991; Bicchieri, 2006) about socially appropriate behavior in the game. This elicitation took place prior to the first harvest decision in each scenario. In the No-norm condition, farmers still listened to an audio recording with the same community members, though this time they discussed topics unrelated to the game, and we did not elicit normative beliefs.

We find that norm activation induces fully sustainable resource management relative to the No-norm condition, but only in the absence of an income shock. Under the income shock, norm activation only weakly mitigates forest stock depletion, and participants report less conservative normative beliefs. Together, these results suggest that social norms may dynamically adapt in times of crisis, providing a complementary behavioral explanation for temporarily higher levels of forest resource extraction when households face acute economic stress.

Our study contributes to four strands of research. First, we contribute to the literature on how shocks—both covariate (affecting an entire group) and idiosyncratic (affecting individuals)—shape cooperation. In linear public goods games, shocks that target the public good tend to reduce cooperation, typically measured as voluntary contributions (Gangadharan & Nemes, 2009; Cherry et al., 2015; Howe et al., 2016; Zhang, 2019). Similar patterns emerge when public goods with uncertain returns are studied with pastoralists (Krendelsberger et al., 2025) or farmers (Cárdenas et al., 2017). Related evidence from the experimental literature on common-pool resources also points to reduced cooperation in abstract (non-framed) settings, for example when participants can share part of their potential harvest with other groups (Safarzynska, 2017). Notably, some studies find the opposite effect in settings where uncertainty interacts with strategic incentives: Schill and Rocha (2023) show that uncertainty about climate-framed shocks can increase cooperation in a fishery game when shock occurrence depends on whether an uncertain stock threshold is crossed. Similarly, Finkbeiner et al. (2018) find that, when combined with communication, uncertainty about shocks can increase cooperation, reflected in lower fish capture rates.

In the context of forest commons, to the best of our knowledge, no study has causally investigated how income shocks affect forest-management strategies. We contribute by providing causal evidence on how an exogenous income shock shapes collective resource management behavior. A key difference relative to many of the studies cited above is that our shock does not change the marginal incentive structure of the extraction game. Instead, it captures a salient channel through which the COVID-19 pandemic may have affected forest users: a decline in non-forest income sources, such as remittances and salaries from employment (Wunder et al., 2021). Our design therefore also contributes new evidence to the debate on the role of forests as safety nets (Wunder et al., 2014; Mulungu & Kilimani, 2023).

Second, we contribute to research on the institutional mechanisms underpinning community-based resource management, including the seminal work of Elinor Ostrom (1990). Prior experimental work shows that formal rules about management behavior—often combined with sanctions for rule violations—can yield (modest) increases in cooperation but rarely achieve full cooperation among forest managers (see Cardenas et al., 2013; Janssen et al., 2013; Gatiso et al., 2015; Handberg & Angelsen, 2015; Gatiso & Vollan, 2017; Kasymov et al., 2022; Zhang et al., 2022). We complement this literature by showing that implicit rules, in the form of social norms and even in the absence of explicit sanctions, can already foster cooperation.

Third, we add to the extensive literature on social-norm interventions, which has largely been developed in abstract laboratory settings and often outside the context of resource extraction (see, for example, Fehr & Fischbacher, 2004; Bicchieri, 2006; Gächter et al., 2017; Fehr & Schurtenberger, 2018; Bicchieri & Dimant, 2022). In environmental applications, norm-based interventions have been shown to increase household waste separation (Bonan et al., 2025), reduce electricity consumption (Allcott, 2011; Allcott & Rogers, 2014; Andor et al., 2020; Brülisauer et al., 2020; Myers & Souza, 2020; Andor et al., 2023), encourage residential water savings (Ferraro et al., 2011; Brent et al., 2015; Jaime Torres & Carlsson, 2018; Brick et al., 2023; Lopez-Rivas, 2024), induce dietary shifts (de Groot et al., 2021), and increase willingness to support climate action more broadly (Andre et al., 2024a). Correcting misperceived norms also shapes pro-environmental behavior[1], for example by increasing sign-ups for recycling programs (Fuhrmann-Riebel et al., 2024) and pro-climate donations (Andre et al., 2024b).

Within forest commons, evidence on the role of social norms remains scarce. Tatari-Chegeni et al. (2025) suggest that personal norms can shape climate change adaptation behavior in forest-dependent communities, but do not provide evidence on the role of social norms within such processes. Eriksson (2025) show that social norms are positively correlated with the intention to implement climate-adapted forestry practices. The study closest to ours is Ghate et al. (2013), who use a similar forestry experiment and provide associational evidence that cooperation reflects deep-rooted norms of sustainability and reciprocity. We extend this line of work by introducing a norm-activation intervention that goes beyond eliciting normative and descriptive beliefs (see also Krupka & Weber, 2013) or providing social-comparison information. Our results show that norms can foster sustainable resource management, while also highlighting their limits in times of crisis.

Lastly, our study contributes to research on the malleability of social norms.[2] Existing evidence suggests that norms can change through, for example, unilateral exposure to radio content (Paluck, 2009) or shifting views about court decisions (Clark et al., 2024). Norm change can also emerge in abstract environments in which an arbitrary norm is established among group members at the beginning of an experiment (Andreoni et al., 2021).[3] We are not aware of studies that examine norm change in response to shocks, particularly in forest-user settings. We show that increased forest extraction becomes more socially acceptable once the community experiences an exogenous income shock, even though, in the absence of a shock, the same community regards fully preserving the forest as the appropriate course of action.

Overall, this is the first study providing rigorous experimental evidence to explain the observed increase in deforestation rates at the beginning of the COVID-19 pandemic. We show that norms can foster cooperation in forest commons in the absence of an income shock and that, during shocks, norms at least partially buffer the pressure to increase harvesting. However, this mitigating effect is limited, consistent with an endogenous shift in normative beliefs:

[1] Such corrections can further shift subsequent descriptive beliefs about others' pro-environmental behaviors (see, e.g., Andre et al., 2024b; Suri et al., 2025).

[2] For a theoretical discussion of when and why norm change occurs, see De et al. (2017) and the special issue on social norm change by Andrighetto et al. (2024).

[3] Szekely et al. (2025) emphasize that both the content and the strength of norms can change.

in times of crisis, deviating from sustainable management becomes more socially acceptable. These findings suggest that additional political and institutional support may be required to sustain collective action for forest conservation in the face of growing climate and geopolitical uncertainty.

The remainder of the paper is structured as follows. Section 2 describes the methods and experimental design, introduces our hypotheses, and provides information on the sample. Section 3 presents the results. Section 4 discusses the findings in relation to the literature and concludes.

2 Methods and sample

Our research complies with good practice standards in research ethics. The study received ethical clearance from the Research Ethics Board at the Center for Development Research, University of Bonn. Voluntary, prior and informed consent was obtained from all participants. The research hypotheses, survey design and sampling approach were pre-registered at the AsPredicted Registry (https://aspredicted.org/5jnk-kbdj.pdf). This section covers information about the study site, experimental procedures, and sample. Furthermore, we describe our experimental design, theoretical predictions, and pre-registered hypotheses. The instructions, survey questions and the transcription of the audio files are displayed in the Supplementary Information (SI) linked to this paper.

2.1 Study site, experimental procedures, and sample

The study area lies within the kebele Sebek a Debiye approximately 50km southwest of Jimma in the Oromia regional state of Ethiopia. At the time of data collection (February 2023), the kebele consisted of 577 households distributed across the five villages of Debiye, Gurati, Kerteme, Meti-chafe and Sokii. These villages are further divided into a total of 24 sub-villages.

The pre-registered criteria for participating in our study are: being male, at least 18 years of age and the head of the household as well as living in the study area. We restricted participation to males mainly to respect the local gender norms which are heavily influenced by Islam, the predominant religion. Since share of female head of households is scarce, it is possible that women in mixed groups may have felt hesitant to speak and freely make decisions in the presence of men.[4]

For determining the sample, we used a two-stage sampling design in which we first randomly selected half of the 24 sub-villages of the kebele and then secondly selected households at random within these sub-villages. Afterwards, groups of three were formed[5] and randomly assigned to one of the between-subject conditions, either NORM or NO-NORM (see Section 2.2 which explains the experimental design of the resource extraction game). Figure 1 displays a map of our study site including the participating households split by our between-subject treatment conditions and village affiliation.

Prior to collecting data, we notified the participants we selected about their potential participation and provided information about the day, time and place of data collection in their respective sub-village. On the actual day, they received additional information about their

[4] See, e.g., Balliet et al. (2011), Charness and Rustichini (2011), and Zhang et al. (2022).

[5] We form groups at the sub-village level due to geographical and time restrictions.

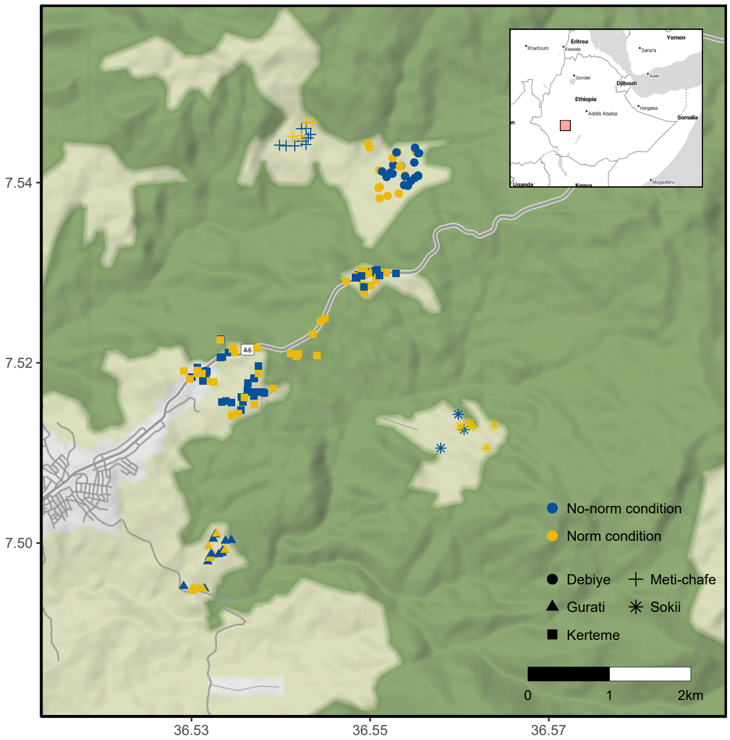

Figure 1: Map of the study site. Blue (Yellow) dots represent participating household in the No-norm (Norm) condition from the five villages Debiye, Gurati, Kerteme, Meti-chafe and Sokii in the kebele Sebek a Debiye, Ethiopia.

participation in our study. After signing the consent form, the study started. The study itself consists of the resource extraction game in groups of three followed by an individual survey conducted in privacy. Once participants had answered the survey, they received their participation remuneration and additionally the payoff generated in the resource extraction game.

Our sample consists of 162 male household heads, i.e., 27 groups per treatment condition.[6] 83.3% originate from the sub-village they still live in today. On average, households consist of 2.79 adults and 2.85 children. The median level of education corresponds to the completion of grades 1 to 4 in school (elementary school). Everyone is at least able to read or write and no one is a college graduate or above. 77.2% are of Oromo ethnicity, the main ethnicity in Oromia regional state, and 85.1% adhere to Islam.

Parts of the kebele is covered by the Belete Gera forest. The altitudes of the five villages range from 1675m to 2075m. In the Belete Gera forest, the native coffee species *Coffea arabica* grows wild and is an increasingly important economic source of livelihood (Takahashi & Todo, 2014; Kebebew, 2023) in addition to traditional agricultural practices, such as growing crops and managing livestock. Our observation points in a similar direction as 93.83% of our participants mention coffee cultivation as a livelihood strategy and 75.9% rank coffee cultivation as the most important income source. 81.48% of participants engage in traditional agricultural practices, i.e., wheat, barley, teff and chat cultivation. 64.81% engage in livestock management, i.e., cattle. 51.23% collect honey or forest products other than coffee. Only 43.83% of participants have off-farm sources of income, i.e., remittances, or daily wages on construc-

[6]The collected individual, household and farm characteristics do not significantly differ between No-norm and Norm (see Table SI-1) indicating a successful randomization into treatment conditions.

tion sites.

In Oromia regional state, voluntary Participatory Forest Management cooperatives are common, who set management rules and bylaws together with the cooperative agencies at the Woreda level. The Belete Gera forest is home to the Waldaa Bulchiinsa Bosonaa (WaBuB; in Oromo language, which translates to Forest Administrators Association in English). In the past, WaBuB was active in our study area, and 80.2% of heads of households were in the cooperative. Today, the kebele is transitioning to a Reducing Emissions from Deforestation and Forest Degradation (REDD+) project. 20.4% of participants had signed up at the time of data collection.

2.2 Experimental design

Our basic design is inspired by Cardenas et al. (2013), Janssen et al. (2013), and Gatiso et al. (2015). Participants collectively manage a community forest in groups of three throughout five rounds. In each round, each participant has to pay a fixed fee for their cost of living in that particular round. In addition, each individual participant can harvest up to 7 trees per round from the community forest, with each harvested tree generating a private payoff for themselves. Participants make this decision independently, privately and simultaneously, and the decisions are kept anonymous to the other group members.[7]

The size of the forest is announced at the beginning of each round. The properties of the game do not allow the forest to be fully depleted at the end of the fifth round, even if the three participants always harvest the maximum of 7 trees per round. The value of the remaining community forest trees at the end of the fifth round is equally shared among all group members. The initial size and maximum capacity of the forest is set to 100 trees and the resource stock re-grows at a rate of 10% at the end of each round. Only full trees can re-grow, i.e., replenishment is truncated.

In the experiment, each participant faces two different scenarios: In No-shock, all group members have an additional exogenous source of income to cover their cost of living. This source of income is independent of participants' harvesting decisions and is meant to represent, for example, wages from other household members or remittances. During Shock, however, this additional source of income is removed while the costs of living stay constant.[8] Groups always play both scenarios in a fixed order: No-shock first, followed by Shock. At the beginning of Shock, the forest is replenished to its maximum capacity as to allow for a clean within-group comparison of behavior and forest size between both scenarios. At the end of the game, each subject is paid according to the sum of their individual payoffs over all 10 rounds, including the shared forest value at the end of each scenario.[9]

[7] We prohibit communications among group members throughout the game.

[8] With this approach, we want to mimic the implications of a systemic shock, such as the COVID-19 pandemic. A focus group discussion prior to the data collection revealed that the implemented income shock reflects the situation in the study area in the first two years of the COVID-19 pandemic and almost all participants in our sample (96.3%) experienced such a negative income shock.

[9] The collected points are transformed into the local currency Ethiopian birr (ETB) at the rate of 0.25 ETB for each point and are paid to each participant in private. In addition, there is a fixed show-up remuneration of 100 ETB for participation. The exchange rate at the time of the data collection was 1 ETB = 0.0175 EUR = 0.0185 USD. We chose the transformation rate and remuneration amount for participation in a way to compensate the participants for their estimated opportunity costs of participating in the study. Before the start of the game, all participants are made aware of the structure, decision set and incentives. Furthermore, they have to successfully answer five comprehension questions regarding the game.

While we vary the scenarios No-shock and Shock within subject, groups are randomly assigned to either the No-norm or Norm condition (between-subject; each condition consists of 27 groups). In Norm, we activate the existing social norms regarding forest management in the community by playing back an audio file—just before the start of the game—where other community members talk about the sustainable management of the local Belete Gera forest and that one should not harvest more than can naturally regrow.[10] Additionally, following the norm-activation approach in Engel and Kurschilgen (2020), we ask participants in Norm to report their normative belief by answering the question "What do you believe is the maximum extraction from the group forest in this game that should generally be expected from every group member?". They answer this question before making their first decision in each of the two scenarios (No-shock and Shock).

To sum up, our study features four treatments defined by a 2 × 2 design: scenario (No-shock and Shock) × condition (No-norm and Norm). Groups of three participants are randomly assigned to be either in the No-norm- or Norm-condition. Within that condition, each group plays the No-shock scenario first and the Shock-scenario afterwards.

2.3 Theoretical predictions

Our basic game follows established experimental paradigms that have been used to study forest extraction behavior. As is theoretically shown, for example in Gatiso et al. (2015), the incentive structure of the basic game induces a divergence between selfish equilibria and social optima. This also holds for our parametrization, as we will demonstrate in the following: We start by showing that selfish groups are expected to extract the maximum number of trees in each round, i.e., 3×7 = 21 trees (see Section 2.3.1). Then, we derive the sustainable solution which is characterized by extracting only 9 trees per round, so that the re-growth keeps the forest at its maximum capacity (see Section 2.3.2). Both extreme strategies and the resulting change in forest size at the end of the round are depicted in Figure 2. They hold for all treatments, as neither the social norm activation nor the negative lump-sum income shock affect the marginal monetary incentive structure. Lastly, we state our pre-registered hypotheses in Section 2.3.3.

2.3.1 Nash equilibrium

We use backward induction to derive the Nash equilibrium. As we have a finite number of rounds, namely 5, which is known to the participants, the payoff for each group member in the fifth round corresponds to

$$\pi_{i,5} = p * \left(\frac{v}{n} * (1+g) * (Z_5 - (t_{i,5} + t_{-i,5})) + t_{i,5}\right) + m_{i,5} - c_{i,5} \tag{1}$$

where Z_5 is the number of trees available at the beginning of the fifth round, p is the value of each harvested tree, v is the additional value of the remaining forest at the end of the game, n is the number of group members who manage the forest together, g is the re-growth rate, $t_{i,5}$ is the number of trees harvested by the given group member in the fifth round, $t_{-i,5}$ is the number of trees harvested by all but the given group member in the fifth round, $m_{i,5}$ is the

[10] To keep conditions as comparable as possible, participants in No-norm also receive an audio exposure, where the same community members talk about the weather and their favorite food.

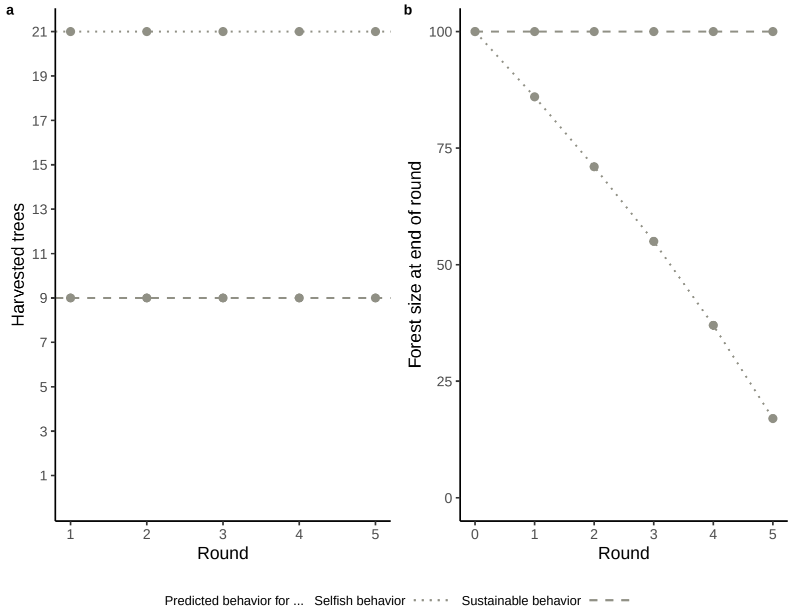

Figure 2: Predicted harvest and forest size for each round. The figure represents the optimal outcomes given selfish and sustainable behavior on a group level. (**a**) When all people in a given group act selfishly, they extract the maximum possible, i.e., 21 trees in every round. Sustainable behavior results in a harvest of 9 trees in each round, which equals the re-growth of the forest when the forest is to be kept at its maximum capacity of 100 trees after regrowth. (**b**) Using the harvest decisions from panel (a) and including the re-growth rate, the forest decreases over time down to 17 trees in round 5 if the group acts selfishly. Sustainable groups harvest exactly what can regrow and, thus, keep the forest at its maximum capacity of 100 trees in every round. Round 0 indicates the forest at the beginning of the game, i.e., at the beginning of round 1 before any decision by any group member has been made. The forest size at the end of each round includes the re-growth.

exogenous income of the group member in the fifth round and $c_{i,5}$ are the exogenous costs of living of the group member in the fifth round. In our game, we use the following parameters $p = 2$, $v = 2$, $n = 3$, $g = 0.1$, $m = 8$ and $c = 8$. Additionally, we have the following two restrictions:

$$t_i \in \{0, 1, 2, 3, 4, 5, 6, 7\} \tag{2}$$

$$Z_r = \min(Z_{r-1}, 100) \geq 0 \tag{3}$$

where r indicates the round. Please note that the re-growth is truncated as only full trees can re-grow. Given these parameters, Equation (1) changes to

$$\pi_{i,5} = 2 * \left(\frac{2}{3} * 1.1 * (Z_5 - (t_{i,5} + t_{-i,5})) + t_{i,5}\right) + 8 - 8 \tag{4}$$

The partial derivative of Equation (4)

$$\frac{\partial\ \pi_{i,5}}{\partial\ t_{i,5}} = 2 * \left(\frac{2}{3} * 1.1 * (-1) + 1\right) \approx 0.53 > 0 \tag{5}$$

indicates that, ceteris paribus, a player's individual payoff in the last round is increasing in the number of trees harvested by that player, independent of what the other players do and of the forest size at the beginning of the fifth round.[11] Therefore, self-centered payoff maximizing players should (be expected to) harvest the maximum number of trees, i.e., 7, in the last round, leading to a group harvest of 21 trees. Through backward induction, it follows that the same holds true for all previous rounds. The symmetric subgame perfect Nash equilibrium for payoff-maximizing players is thus to always harvest the maximum number of trees in each round.[12]

2.3.2 Sustainable solution

As an alternative to the consideration of the individual strategy to maximize own payoff, we derive the social optimum by focusing on the aggregated group payoff which corresponds to

$$\Pi_5 = p * \left(n * \frac{v}{n} * (1+g) * (Z_5 - T_5) + T_5\right) + M_5 - C_5 \tag{6}$$

Using the same parameters as in Section 2.3.1, with the difference that the variables $T_5 = \sum_{i=1}^{n} t_{i,5}$, $M_5 = \sum_{i=1}^{n} m_{i,5}$, and $C_5 = \sum_{i=1}^{n} c_{i,5}$ represent the aggregated harvest, exogenous income and additional costs of living, Equation (6) changes to

$$\Pi_5 = 2 * \left(3 * \frac{2}{3} * 1.1 * (Z_5 - T_5) + T_5\right) + 24 - 24 \tag{7}$$

The partial derivative of Equation (7)

$$\frac{\partial \Pi_5}{\partial T_5} = 2 * \left(3 * \frac{2}{3} * 1.1 * (-1) + 1\right) = -2.4 < 0 \tag{8}$$

indicates that the social payoff in the last round strictly decreases with each harvested tree. Considering the maximum carrying capacity of the forest represented by Equation (3), the social optimum is maximized when exactly 100 trees are left at the end of the game. While there are many harvesting paths which would lead to this over the course of the five rounds, there is a unique sustainable solution that maximizes the overall group payoff earned in this game by having the group harvest exactly the re-growth of 9 trees in every single round.[13]

2.3.3 Hypotheses

The theoretical predictions about both the subgame perfect Nash-equilibrium for self-centered payoff-maximizing players and the sustainable forest extraction path are the same for all treatments (with and without the income shock or the norm activation). Yet, following the general idea of Elinor Ostrom's seminal work on the governance of commons (see e.g. Ostrom, 1990, 2000a) but also the findings of Engel and Kurschilgen (2020) on how a social norm nudge restrains free-riding in social dilemma situations, we expect that activating subjects' local community norms with regard to forest management leads to a smaller extraction of trees

[11] Since re-growth only allows full trees to re-grow, there may be a slight discontinuity in an individual player's payoff, if, and only if, i) two players harvest the maximum number of trees, and if, ii) a third player's harvest of 7 trees exceeds the threshold, such that one tree less re-grows, and harvesting 6 would not. In this case, the third player's payoff from the one additionally re-grown tree at the end of round 5 slightly outweighs the player's payoff from the harvested one.

[12] This also holds for NORM and SHOCK treatments because they do not affect an individual player's marginal incentive structure. The negative shock only reduces the overall payoff by a fixed amount.

[13] A detailed explanation is depicted in Section 1.1 in the SI.

in the game community forest, especially because the local norms are centered around the sustainable management of the Belete Gera forest. In line with the argument by Wunder et al. (2021), we furthermore expect that, when exposed to an exogenous income shock, subjects will increase their extraction of the community forest to compensate the monetary loss. However, we expect that the will of adhering to the social norms is stronger than the urge to compensate the income loss, thus groups where we activated social norms will keep on managing the resource sustainably even when faced with an exogenous income loss. This leads us to formulate the following pre-registered hypotheses:

Hypothesis 1: The activation of social norms will lead to more cooperation toward sustainable management of natural resources.

Hypothesis 2: A negative exogenous income shock will lead to less cooperation toward sustainable management of natural resources.

Hypothesis 3: If faced by a negative exogenous income shock, the activation of social norms will lead to more cooperation toward sustainable management of natural resources.

3 Results

This section first looks at the effects from Norm and Shock as well as their interaction (see Section 3.1). We find that the norm activation fosters full cooperation in almost all the group in absence of the income shock. The income shock leads to higher extraction from the community forest both with and without previous activation of social norms. We explore in Section 3.2 why norms seem to not mitigate the effect of the shock treatment and find that the norm actually changes: unsustainable practices become socially appropriate in times of crisis. Lastly, we provide different pre-registered robustness checks in Section 3.3. We conducted the statistical analyses using R version 4.2.2 (R Core Team, 2022). A replication package will be provided on OSF.

3.1 Treatment effects on forest management

Figure 3a displays the average number of harvested trees per group in all four treatments. Rounds 1 to 5 on the left-hand side of the graph depict the No-shock scenario. Here, groups in No-norm (blue line) harvest on average more than the sustainable take-rate of 9 trees in all but one round. The corresponding development of the total forest size is depicted in Figure 3b: The forest in treatment No-norm and No-shock decreases over time to an average of 92.19 trees at the end of the last round.

In contrast, the groups in Norm harvest on average less than what they could harvest given the sustainable harvest rate (yellow line in Figure 3a). The average harvest in each round is significantly lower for Norm than for No-norm (see Table SI-2). Consequently, groups in treatment Norm and No-shock manage to retain forest levels at almost maximum capacity throughout all five rounds (yellow line on the left-hand side of Figure 3b): For all but 2 (out of 27) groups, the final forest size at the end of the No-shock scenario is $\geq$ 99 out of 100 trees; resulting in a mean final forest size of 99.56 trees across all groups in treatment Norm and No-shock. Comparing the outcomes in the No-shock scenario between No-norm and Norm, in

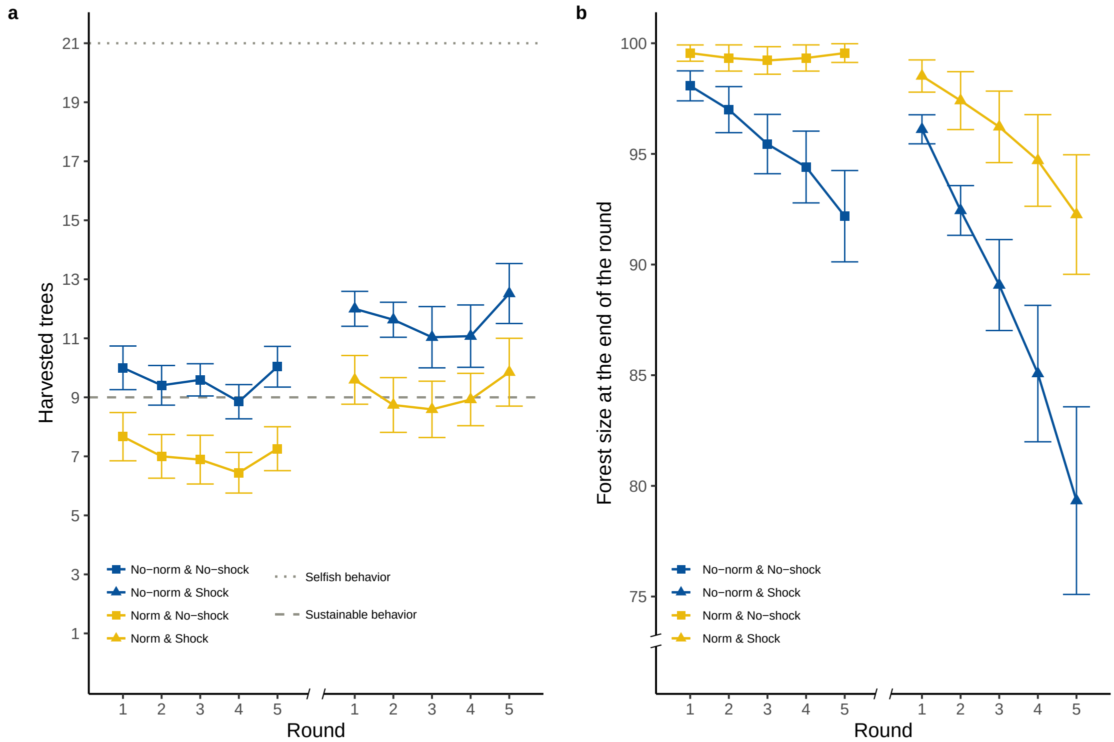

Figure 3: Average number of harvested trees and forest development. The figure shows data of the conditions without (blue) and with (yellow) norm activation before (square) and during (triangle) the income shock. The bars indicate the 95% confidence interval. Results of pairwise comparisons are displayed in Table SI-2 and SI-3. (**a**) Panel (a) shows the average number of harvested trees per group. The predicted outcomes given sustainable (selfish) behavior on a group level are depicted with dashed (dotted) lines. Sustainable behavior results in a harvest of the re-growth, i.e., 9 trees in each round. When all people in a given group act selfish, they extract the maximum possible, i.e., 21 trees in each round. (**b**) Panel (b) shows the average forest size per group at the end of each round.

each round forest sizes are significantly larger when we activated local norms (see Table SI-2). This result suggests that—in absence of other institutions—the presence of social norms can provide the necessary strength to foster cooperation in a commons-dilemma.

The aforementioned results can also be seen in Column (1) of Table 1, which shows the estimates of a corresponding random effects model: Tree extraction is 2.53 trees lower across all rounds in NO-SHOCK when social norms on extraction behavior of the local Belete Gera forest were activated, compared to the same scenario without such activation. This translates to an increase in forest size of 3.98 trees compared to the NO-NORM condition (see Column (3) of Table 1). Thus, activating existing norms of sustainable forest management is able to keep the forest in our resource extraction game at a sustainable level.

Result 1: The activation of social norms leads to more cooperation toward sustainable management of natural resources.

We now shift focus from the NO-SHOCK scenario to SHOCK. Here, participants loose their additional exogenous source of income but still continue to incur costs of living in every round. During the presence of this shock, the harvest behavior within NO-NORM changes significantly (blue lines in Figure 3a). On the group level, in each round the harvest significantly increases in SHOCK by more than 1.5 trees (see Table SI-3), which corresponds to the

Table 1: Treatment effects on harvest level and forest size

	Dependent variable:			
	Harvest (group)		Forest size (end)	
	(1)	(2)	(3)	(4)
Constant	9.58***	9.58***	95.42***	96.34***
	(0.22)	(0.22)	(0.63)	(0.86)
NORM	−2.53***	−2.53***	3.98***	10.08***
	(0.33)	(0.33)	(0.66)	(1.98)
SHOCK	2.07***	2.07***	−7.01***	−7.86***
	(0.25)	(0.25)	(0.74)	(0.84)
NORM × SHOCK	0.01	0.01	3.44***	−0.74
	(0.39)	(0.40)	(1.03)	(1.55)
Model	RE	Tobit	RE	Tobit
Observations	540	540	540	540

Notes: The table reports coefficient estimates from random effects (Columns (1) and (3)) and Tobit (Columns (2) and (4)) models. Further information are displayed in Table-SI4 and Table-SI6. Clustered-robust standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

SHOCK-coefficient estimate of 2.07 in the random effects model in Column (1) of Table 1. Consequently, in NO-NORM the total forest is depleted faster in SHOCK than in NO-SHOCK (see Figure 3b and Column (1) of Table 1).

The same pattern emerges in the NORM condition: SHOCK significantly increases the harvest in each round by more than 1.7 trees on average (see yellow lines in Figure 3a and Table SI-3). This depletes the total forest significantly more than in NO-SHOCK (yellow lines in Figure 3b). Taken together, we find that participants' behavior in both the NO-NORM and NORM conditions changes in response to the income shock, even though marginal monetary incentives and payoff-maximizing strategies remain the same as in the NO-SHOCK scenario.

Result 2: A negative exogenous income shock leads to less cooperation toward sustainable management of natural resources.

3.2 The role of social norms in face of income shocks

In SHOCK, the slope of forest depletion is less steep in NORM than in NO-NORM (comparing the blue and yellow lines on the right-hand side of Figure 3b), suggesting that the activated norms help to reduce the negative impact of the income shock on forest management. This is underlined by the significant and positive interaction term of NORM and SHOCK in the corresponding random effects regression models (see Column (3) of Table 1 and Table SI-5).

Though social norms seem to mute deforestation, they are not able to prevent the community from shifting to unsustainable forest management practices in the SHOCK scenario.

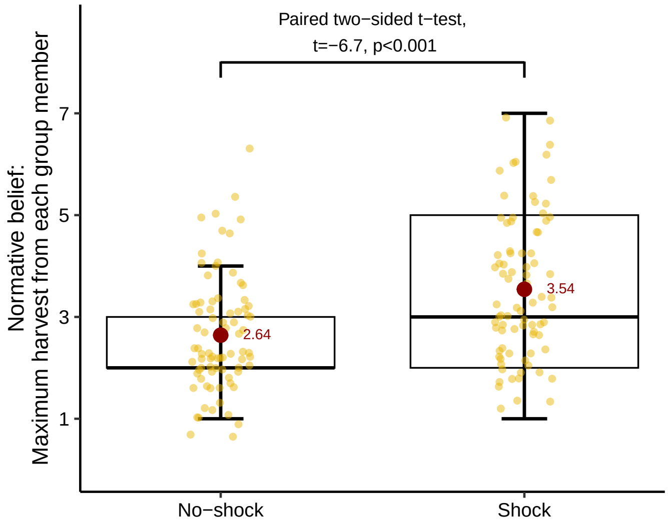

Figure 4: Maximum harvest belief in social norms condition before and after the shock. The figure shows the answer to the following question: "What do you believe is the maximum harvest from the community forest in this game that should generally be expected from every group member?" The red values indicate the means and the solid black lines show the medians. The lower and upper hinges correspond to the first and third quartiles.

Harvest increases in the NORM condition (yellow lines in Figure 3a), leading to an overall forest decline (yellow line in Figure 3b). Accounting for the truncated nature of our dependent variable (see Figure SI-3) by using a Tobit model (see Column (4) of Table 1), we see that the interaction term of NORM and SHOCK becomes insignificant.

Result 3: When facing a negative exogenous income shock, the activation of social norms does not lead to more cooperation toward sustainable management of natural resources.

What could explain this limited effectiveness in the presence of an income shock? First, note that participants' decisions are aligned with their normative belief: On average over all 5 rounds in NO-SHOCK, participants select a higher harvest than their belief in only 23.21% of the decisions. Looking at SHOCK, this number varies slightly, but never exceeds 35% (see Figure SI-11). Comparing both scenarios, we do not find significant differences in participants' rates of adhering to their normative belief. Thus, an increase in the share of participants not following their normative belief is unlikely to provide an explanation for the higher harvest rates in SHOCK.

Second, however, we find the norm to change in presence of an income shock: The normative belief significantly increases from 2.64 trees to 3.54 trees on average (see Figure 4), i.e., extracting almost one full tree more becomes the new social norm. Furthermore, the interquartile range of the normative beliefs becomes larger, suggesting that the uncertainty about the norm increases in presence of an income shock. As harvest decisions highly correlate with participants' normative expectations (see Figure SI-12), the new norm to overuse the forest leads to unsustainable forest management.

Result 3a: If faced by a negative exogenous income shock, the social norm of sustainable resource management changes and unsustainable practices become socially appropriate.

3.3 Robustness checks

The aforementioned impacts of Norm and Shock are robust when including control variables (see Table SI-4 to Table SI-6), except for the interaction effects of Norm and Shock on forest size, which seem to vary depending on the model selection. This emphasizes that social norms on their own may be insufficient to prevent resource exploitation during times of economic crisis. Furthermore, we find qualitative differences neither within any of the sub-villages (see Figures SI-13 to SI-17 and Table SI-10), nor when adding pre-registered interactions of trust (see Figure SI-8 Table SI-8) and relationship closeness (see Figure SI-5 and Table SI-9) with our Norm and Shock treatments. As the group level analysis does not allow to control for individual and farm characteristics, we additionally estimate a random effects model on the participant level (see Table SI-7) which is able to robustly reproduce the group results.

4 Discussion and conclusion

Our framed field experiment introduces a negative exogenous income shock and activates existing social norms in a resource extraction game in which rural smallholder farmers and forest users in Ethiopia manage a community forest in groups. We find that social norms foster sustainable forest management. The idea that embedded norms shape decision-making in such games was put forward by Ghate et al. (2013). We provide causal evidence consistent with this mechanism. Specifically, Ghate et al. (2013) report associational evidence that, even without communication, cooperation can prevail, potentially because participants bring deep-rooted real-life norms of sustainability and reciprocity into the experimental setting. This interpretation is also consistent with our finding that participants in the No-norm and No-shock conditions behave relatively unselfishly, harvesting on average only slightly above the sustainable harvest level.

Our results also help explain why experiments that include communication often observe lower and more homogeneous harvest rates with communication than without (Ghate et al., 2013; Zhang et al., 2022). Communication can provide cues about prevailing extraction norms through information about other group members' intended harvest levels and beliefs. It may also enable explicit discussion and agreement on appropriate harvesting behavior, thereby facilitating coordinated cooperation (El Zein et al., 2019).

In our design, norm violations were neither directly monitored nor subject to (monetary) sanctions. The anonymity of the decision-making process precluded direct social sanctions. Still, norm activation induced sustainable forest management in the absence of shocks and mitigated, though did not fully prevent, unsustainable management in the presence of a shock. Outcomes may differ in settings where (social) sanctions are feasible. This expectation is motivated by the higher dispersion in normative beliefs under Shock than under No-shock: individuals who maintain strong normative expectations even under shock-induced hardship may be willing to sanction rule-breakers to conserve the resource (Fehr & Schurtenberger, 2018). Comparable experimental studies without shocks show that sanctions can affect harvest behavior (Cardenas et al., 2013; Janssen et al., 2013; Gatiso et al., 2015; Handberg & Angelsen, 2015; Gatiso & Vollan, 2017; Kasymov et al., 2022; Zhang et al., 2022). Observational research on forest user groups also documents positive effects of rules—especially when designed by local groups themselves—on the effectiveness and durability of community-based forest governance (Ostrom, 1990; Cox et al., 2010; Vasconcelos et al., 2013; Epstein et al., 2021; Fischer et al., 2023). In such settings, social norms and beliefs are important drivers of rule compliance (Gächter et al., 2025). At the same time, disagreement about norms can give rise to antisocial punishment (Herrmann et al., 2008; Rand & Nowak, 2011; Molleman et al., 2019), which may further undermine efforts to prevent forest clearance (Kosfeld & Rustagi, 2015). This highlights an important direction for future research: understanding when norms and sanctions complement each other to enhance resilience during crises, and when they instead exacerbate conflict and resource degradation.

Several studies on linear public goods games introduce covariate and idiosyncratic risks and find that these risks reduce contributions to the public good (Gangadharan & Nemes, 2009; Cherry et al., 2015; Howe et al., 2016; Cárdenas et al., 2017; Zhang, 2019; Krendelsberger et al., 2025). Our shock implementation differs from this literature because it does not affect the returns to harvesting or the value of the remaining forest. Instead, the shock exogenously reduces participants' income in every round, mimicking one channel through which the COVID-19 pandemic may have affected forest users. As a result, standard equilibrium predictions in our game remain unchanged, and behavioral changes can be attributed to the income shock itself rather than to altered marginal incentives. In parallel, global studies document increases in deforestation rates during pandemic lockdowns in some regions of the Global South (Brancalion et al., 2020; Céspedes et al., 2023). In many of these contexts, forest resources may have been used to compensate for pandemic-related income losses, thereby serving as a safety net (Wunder et al., 2014; Mulungu & Kilimani, 2023). Our results provide experimental evidence on the behavioral mechanisms that can operate in settings where forests constitute a key alternative income source during economic hardship.

Building on these insights, we find that increased reliance on the forest during hardship is viewed as socially acceptable, suggesting that the prevailing norm of sustainable management may adjust in response to sudden shocks. While norm change is often portrayed as a gradual process shaped by evolving ecological and cultural conditions (Gelfand et al., 2024; Lowes & Nunn, 2024) or by prolonged exposure to media (Paluck, 2009; Constantino et al., 2022), our findings raise an important conceptual question: are we observing a shift in the prevailing norm, or the activation of a distinct, crisis-contingent norm that coexists with sustainability norms in normal times? Distinguishing between these mechanisms matters because social norms—and changes in norms—are key drivers of climate-related behaviors and policy support (Constantino et al., 2022). A central avenue for future research is therefore to identify how crisis conditions reshape normative beliefs, how persistent such shifts are, and under what conditions they translate into long-run changes in resource-use behavior once economic conditions normalize.

In summary, our results suggest that activating social norms can increase the sustainability of collective forest management. At the same time, external economic shocks reduce the effectiveness of norm activation. This points to the need for complementary policy and institutional mechanisms to support conservation efforts in forest user communities facing increasing climate and geopolitical uncertainty. More research is needed to understand how normative architectures adapt during crises, how they interact with enforcement institutions, and how this interaction ultimately shapes resilience in common-pool resource governance.

Declaration of competing interest
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of AI and AI-assisted technologies in the writing process
During the preparation of this work, we used ChatGPT in order to improve readability and language. After using this service, we reviewed and edited the content as needed and take full responsibility for the content of the publication.

Authorship contribution statement
Dominik Suri: Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Jan Börner:** Conceptualization, Writing – review & editing. **Zerihun Kebebew:** Conceptualization, Data collection. **Sebastian Kube:** Conceptualization, Writing – review & editing.

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Supplementary Information

for

When needs change norms: Experimental evidence that income shocks undermine norm-driven cooperation in forest commons

by

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Contents

1 Material and Methods

1.1 Theoretical predictions - Understanding the sustainable solution

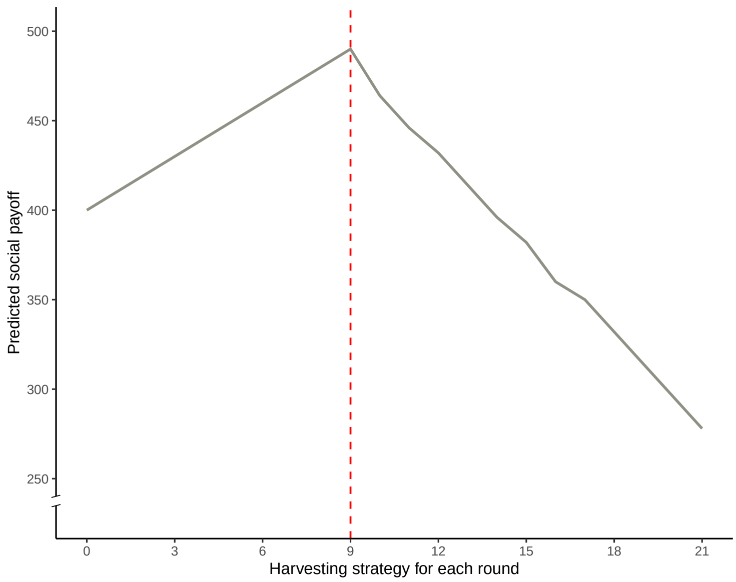


Figure SI-1: Predicted total group payoff. The figure shows the total group payoff if the group harvests a certain number of trees in each round. The non-monotonic decrease on the right-hand side of the maximum predicted payoff is due to the truncated re-growth of the forest.

Figure SI-1 depicts the total group payoff received over the course of all 5 rounds, including the payoff from the trees remaining in the forest at the end of the fifth round. Here, we simplify by only showing a symmetric harvesting strategy over the course of all 5 rounds, i.e., groups harvest the same number of trees in each round. The results do not change with varying harvest rates across rounds. The maximum group payoff is obtained if exactly 9 trees are harvested by the group in each round.

Why is this the case? (i) Assume the group harvests less than 9 trees while the forest is at its maximum capacity, for example in the first round. Then, the maximum number of trees that can re-grow is less than 9 trees due to the constraint given by the maximum capacity of 100 trees. Thus, if the group harvests less than 9 trees in that given round, the forest would still re-grow to 100 trees but the group would miss out on the potential gain of harvesting the difference to 9 trees, therefore not maximizing the group payoff. (ii) Now, assume the group harvests more than 9 trees. Then, independent of the forest size at the beginning of that round, the forest will not be at its maximum capacity at the end of that particular round, thereby not maximizing the group payoff either.

Thus, harvesting the maximum re-growth of 9 trees throughout the game is the strategy which maximizes the group payoff because it maximizes the number of trees that can be harvested while keeping the forest at its maximum capacity. Please note that, while this is the unique solution from the group perspective, the individual harvest rates can vary between players as long as the harvest aggregates to exactly 9 trees. Particularly appealing might be the symmetric harvest decision of 3 trees by each group member. Please further note that this sustainable solution again does not change in the shock scenario, because the income loss does not affect the marginal incentive structure of the group (see Equation (8) in the manuscript) but only reduces the overall payoff.

1.2 Experimental instructions (English)

[These instructions are to be read and explained to each group.]

Welcome! First of all, we would like to thank you for accepting our invitation and for participating in this research study. The objective of the study is to generate data for our research project. It does not have any political or religious objectives.

The study consists of two components. First, you play an economic game in a group of three. Afterwards we will ask each of you some individual questions. In both components, there is no "right" or "wrong" answer.

You will receive 100 Ethiopian Birr for participating in this study. In addition, you can earn a bonus payment which depends on the decisions of you and your group in the economic game. This money is not from our private pockets but given to us by our university. Let us start with the game.

During the game, we do not speak in terms of Ethiopian Birr but in points. At the end of the game, the total amount of points you have earned is then transformed into Ethiopian Birr at the rate of 1 point = 0.25 Ethiopian Birr. You will then receive your earnings as a bonus payment. This bonus payment will be paid in private, so others do not know how you decided during the game.

The game consists of two parts. In each part, we will ask you to make decisions. You can earn points for your bonus payment in each part. Before we start with explaining the structure of the game, we want to clarify the following:

1. During the game, you are not allowed to communicate with each other. Your decisions are private, so nobody of your group members should be able to hear or see what you have decided. If you have questions during the game, raise your hand and we will come to you.
2. It is very important that you understand the game. Thus, listen carefully to the instructions. If you have any questions while we are explaining the game, do not hesitate to ask. Before starting the game, there will be some easy questions of understanding. If you cannot answer these questions, you will be excluded from this study.
3. The game will last for about 1.5 hours, including waiting time. If you already know that you will not be able to stay for the 1.5 hours, let us know immediately, so that we can find somebody else. The same holds if you wish to not participate in this research study for any reason.

Now, let us explain part 1 of the game.

In this game you are making decisions about the management of a forest. This game consists of 5 rounds. Each one of your group can decide on how many trees you want to extract from this forest in every round. When you extract trees, you can earn points. However, extracting trees also mean that the forest becomes smaller over time. You can also earn points for each tree that remains in the forest after the end of the 5th round.

For each tree that you extract in each round, you will receive 2 points. The maximum amount each of you can extract in one round is 7 trees. You can extract no trees, one tree, two trees, ..., up to 7 trees in each round. That means that you will receive 0 points if you extract no trees, two points if you extract one tree and up to 14 points if you extract all 7 trees.

[Visually show the trees.]

In front of you, you have 7 tokens which represent the number of trees you can extract in each round at most. You also have two envelopes, a larger brown and a smaller white one, and an identification card. You can decide how many trees you want to extract in each round. Put the number of tokens you want to extract in the smaller white envelope. Then put the white envelope, all remaining tokens and your identity card in the larger brown envelope. We will collect the brown envelopes if everyone of you has decided how many trees you want to extract. We will then count the tree tokens and give you all 7 tokens, both envelopes and the identity card back for the next round.

[Visually show how this works.]

All remaining trees at the end of round 5 also give you points. The number of the remaining trees are doubled and then each of you receive an equal share of the value of these trees. For example, if there are 15 trees left at the end of round 5, we will double these 15 trees to 30 trees. Each tree has a value of 2 points, so the remaining forest has a value of 60 points. Then, each one of you will receive an equal share: Each one of you will receive 20 points.

There are 100 trees in the forest at the beginning of the game. After you have decided on how many trees you want to harvest, for every 10 trees remaining 1 new tree will be added to the forest as re-growth. For example, if there are 85 trees left at the end of a round, 8 new trees will be added to the forest. However, there cannot be more than 100 trees in the forest in any round.

[Visually show the game. Show 85 trees. Show how 8 trees are added.]

The number of trees in the forest at the beginning of a new round is determined as follows: We will take the number of trees at the beginning of the previous round. Then we remove the number of trees from the forest which your whole group has extracted in the previous round. We will tell you this number but we will not tell you how many trees each person has extracted individually. Afterwards we will add new trees according to the re-growth rate. This new number of trees is then the size of the forest at the beginning of the next round. This means that the more trees you harvest, the smaller the forest becomes over time.

In each round you have an additional source of income of 8 points. Think of this as, for example, an additional profit from agricultural activities. In each round you also have costs of living of 8 points. Think of this as expenditures for agricultural inputs, education for household members or groceries. The additional income is added to the amount of points you receive in each round and the costs of living are subtracted. This means that you will receive 8 points in each round and then 8 points are subtracted again.

This is the idea of the game. Do you have any questions?

[Answer the questions.]

Before we start with the game, we want to ask you some questions of understanding because we want to make sure that you have understood how the game works.

- Do you receive points for the size of the forest at the end of the game?
  Correct answer: yes
- Does the size of the forest at the end of the game depend only on your decisions?
  Correct answer: no, also on the decisions of the others
- How many trees can you harvest at most in every round?

Correct answer: up to 7

- Can you freely decide how many trees you want to harvest in each round?
  Correct answer: yes, everyone can choose to harvest 0, 1, 2, ..., 7 trees in each round
- Can the forest grow larger than 100 trees?
  Correct answer: no

Now, let us also show you three examples, so that you understand the mechanism of the game.

[Visually show these examples:

1. *65 trees are available at the beginning of the round. Player A takes 5, player B takes 2 and player C takes 3. 10 trees are taken off of the board. 5 new trees are added to the board as re-growth. There are now 60 trees for the next round. Player A receives 10 points, player B receives 4 points and player C receives 6 points.*
2. *60 trees are available from the previous round and no player harvests anything. 6 trees are added to the board. There are now 66 trees for the next round. No one receives points this round.*
3. *66 trees are available and player A takes 1 tree, player B takes 3 trees and player C takes 7 trees. Player A receives 2 points, player B receives 6 points and player C receives 14 points. 55 trees are left in the forest. Now, 5 trees are added as re-growth. This is the last round. At the end of the game 60 trees are left. Now, the number of trees is doubled to 120 and then split equally among player A, B and C. Everyone receives 40 points in addition to what they have earned so far.*
   Player A receives 10 points (round 1) + 0 points (round 2) + 2 points (round 3) + 40 points for the final size of the forest = 52 points.
   Player B receives 4 points (round 1) + 0 points (round 2) + 6 points (round 3) + 40 points for the final size of the forest = 50 points.
   Player C receives 6 points (round 1) + 0 points (round 2) + 14 points (round 3) + 40 points for the final size of the forest = 60 points.

]

Do you have any questions?

[Answer the questions.]

From now on you are not allowed to communicate anymore until the game is finished. If you have a question throughout the game, raise your hand and we will come to you.

Before you start with your decisions, listen to the following audio file.

[An audio file is plaid back. The content differs between the No-norm and Norm condition.]

[ONLY FOR THE NORM CONDITION:

Before you make your first decision, answer the following question: “What do you believe is the maximum extraction from the group forest in this game that should generally be expected from every group member?”

Answer this question by putting the number of tokens that you believe into the small envelope and then put the small envelope, the remaining tokens and the identification card in the large envelope. Your answer is never made available to the other group members.]

[The game starts.]

Part 1 has finished. Let us now explain part 2.

In part 2 you will play the same game as in part 1. The forest is re-filled to 100 trees at the beginning of the first round of part 2. The structure of the game is the same as for part 1 and you will also make your decisions in private. The only difference in part 2 is the following: You will not have the additional income of 8 points in each round. That means that in each round, you will receive points according to the number of trees you extract in this round. We then subtract the costs of living of 8 points. If you would get negative points in one round, the points you have collected before, also in part 1, are used to compensate these negative points. For example, if you extract 2 trees in one round, then you will receive 4 points for the trees but 8 points are subtracted. So in this round you will lose 4 points. Then, these 4 points will be subtracted from the points you have collected in the rounds before, including the rounds of part 1. Again, the number of trees left at the end of part 2 will also give you points similarly as in part 1.

Before we start with part 2, are there any questions?

[Answer questions.]

Remember that you are not allowed to communicate until the game is finished. If you have a question throughout the game, raise your hand and we will come to you.

[ONLY FOR THE NORM CONDITION:

Before you make your first decision, answer the following question: “What do you believe is the maximum extraction from the group forest in this game that should generally be expected from every group member?”

Answer this question by putting the number of tokens that you believe into the small envelope and then put the small envelope, the remaining tokens and the identification card in the large envelope. Your answer is never made available to the other group members.]

[The game starts.]

1.3 Audio file content

1.3.1 No-norm condition

The audio file has a duration of 1 minute and 43 seconds.

Researcher: Gaafiin isin gaafa. Kaleessa qileensi naannoo kana maal ture? (English translation: Let me ask you a question. What was the weather like yesterday?)

Audience: Dumeessa. (English translation: It was cloudy.)

Researcher: Isinnoo maal jettu? (English translation: What do others say?)

Audience: Kaleessa dumeessa qaba. (English translation: Yesterday, it was cloudy, and there was even a light shower of rain.)

Researcher: Hundumti keessan walgaltu? (English translation: Do you all agree?)

Audience: Eeyyeen. Sagale jala dhagahama. (English translation: Yes. *Background noise.* Yes, it was cloudy, and there was a light rain at midnight.)

Researcher: Gaafii bira isin gaafa. Nyaachi naanno kanatti baayee jalatamu maalla? (English translation: Let me ask you another question. What is the favorite local food around here?)

Audience: Umi.. (English translation: Ummm..)

Researcher: Nyaacha hin beekamu naannoo kanatti nyaachi gosa adda addaa qaba. (English translation: If there isn't a specific well-known dish in the area, which various types of food are available?)

Audience: Xaafii. (English translation: Teff.)

Researcher: Nyaacha jechuun waanta nyaatamu dha. (English translation: Food refers to anything that is eaten.)

Audience: Xaafii fi boqqolloo. Miti marqaa fi ittoo dha. Salagee jala. (English translation: Teff and maize... No it is porridge and wot. *Background noise.*)

Researcher: Kanuma? (English translation: Is that everything?)

Audience: Kan irra caala jalatamu buddeenaa fi Ittoo dha. (English translation: Injera and meat are the favorite foods in the area.)

1.3.2 Norm condition

The audio file has a duration of 1 minute and 39 seconds.

Prior to playing back the audio file, Researcher: You will now hear what other community members have answered to the question "How do you use the Belete forest?".

Audience: Baayisee muree galii argachu irra xiqqa dhuma xiqqaa dhaan itti fayyadamu deemuu dha kanan arge yookiin kan natti dhagahamu. Irra guddaa namoonni keenya argeen kan beeku bicuu galii yaraan fayyadama deemu malee haruma dhaqnee murree galii guddaa argana keessa baana jedhani hin yaadani. (English translation: Rather than harvesting large quantities for immediate income, I have observed that only small amounts are harvested, allowing the resources to last longer. In our community, the focus is on harvesting sustainably, taking only what is needed to use over time. No one ever considers harvesting everything at once for quick profit, as this would deplete the resources.)

Audience: Ani galii xiqqaadhaan jiradhee biyyi uumanni akka hin miidhamne hojjechuu fi jiraachuuttu filatama dha. Kana jechuun mukatti dhibbi baka tokko yoo jiraatte shantama muruu irra mukkaa dhibba shan dhibba sadi keessa muka sadi afuri qusannoo dhaan akka bosoni hin miidhamne akka uummani hin midhamne akka haali qileensa hin miidhamne gochuuttu filatamaa dha. (English translation: I prefer to earn a small income so that it doesn't negatively affect the local people or the country. For example, if there are 100 trees, instead of harvesting 50 out of 100, it's better to harvest three or four out of 300 or 500 trees. This way, the forest, the people, and the climate aren't harmed.)

Researcher: Kanaaf.. (English translation: So..)

Audience: Sagalee jala. Faayidaa hawaassa waliin walsimattee deemuu qaba. Ani galii guddaa argadhee bosoni uumanni miidhamu hin qabu. (English translation: *Background noise.* It must align with the interests of the local people. It shouldn't focus on getting more income if it harms the forest or the community.)

Researcher: Umi.. (English translation: Ummm..)

Audience: Akka kootitti baayee gaarii dha. Wanta tokkoo itti fayyadamuuf akka dhuunfa kootii yoo basoni argamee hanga dhuunfa koo itti fayyadameerra jedhaani yaada kana booda wanta uumaatta irra miidha geesisu hin hojjedhu jedheen yaada. (English translation: In my view, it's good to use something to its full potential as an individual. From now on, I don't want to use the forest in a way that affects the local community.)

1.4 Questionnaire (English)

The questionnaire was conducted orally in Oromo using the following script. The answers were directly entered into KoboToolbox.

01-What is your education level? <single choice>

- Unable to read or write
- Able to read or write only
- 1-4 grade
- 5-8 grade
- 9-12 grade
- College graduate or above
- Prefer not to answer

02-Are you born in this sub-village? <single choice>

- Yes
- No
- I don't know
- Prefer not to answer

03-If answer to 02 is "no", then: Where are you from? <single choice>

- Same village
- Same kebele
- Same woreda
- Other woreda in Oromia
- Other kilil
- Outside of Ethiopia
- I don't know
- Prefer not to answer

04-If answer to 03 is "same kebele", then: In which village of this kebele are you born? <single choice>

- Debiye
- Kerteme
- Meti
- Soki
- Gurati
- Other (specify)
- Prefer not to answer

05-If answer to 02 is "no", then: How old were you when you moved to this sub-village? <integer field>

06-For how long have you lived in this sub-village (in years)? <integer field>

07-Which religion do you belong to? <single choice>

- Christian Ethiopian Orthodox
- P'ent'ay (Protestant)
- Muslim
- Other (specify)
- Prefer not to answer

08-To what ethnic group do you belong to? <single choice>

- Oromo
- Amhara
- Tigree
- Keffa
- Guraghe
- Yem
- Other (specify)
- Prefer not to answer

09-How many adults (18 years and above) live in your household (including yourself)? <integer field>

10-How many children live in your household? <integer field>

11-If you need help (for example in case of a shortage of money or of food), how many people in your sub-village would you approach and ask for help? (Indicate as percentage: Out of 100 people, how many would you approach?) <integer field>

12-Think about the land you pay taxes for ("own property"). What is the total area you use (in ha) for livestock grazing? <integer field>

13-Think about the land you pay taxes for ("own property"). What is the total area you use (in ha) for agriculture (except coffee cultivation)? <integer field>

14-Think about the land you rent from others. What is the total area you use (in ha) for livestock grazing? <integer field>

15-Think about the land you rent from others. What is the total area you use (in ha) for agriculture (except coffee cultivation)? <integer field>

16-Think about the land which is open for everyone. What is the total area you use (in ha) for livestock grazing? <integer field>

17-Think about the land which is open for everyone. What is the total area you use (in ha) for agriculture (except coffee cultivation)? <integer field>

18-Think about coffee cultivation. What is the total area you use (in ha) for coffee cultivation in your home garden? <integer field>

19-Think about coffee cultivation. What is the total area you use (in ha) for coffee cultivation inside the Belete forest? <integer field>

20-Do you share coffee cultivation (preparation, planting, weeding) with other people in your community? (dabo, daddo) <single choice>

- Yes
- No
- Prefer not to answer

21-Do you share the coffee harvesting with other people in your community? (dabo, daddo) <single choice>

- Yes
- No
- Prefer not to answer

22-Was someone from your household affected by the COVID-19 disease? For example, was someone infected by COVID-19? <single choice>

- Yes
- No
- Prefer not to answer

23-Was someone from your household affected by the COVID-19 disease? For example, was someone not able to work in his/her job (also for a short period of time) due to a COVID-19 outbreak at the work place or general COVID-19 related restrictions? <single choice>

- Yes
- No
- Prefer not to answer

24-Was someone from your household affected by the COVID-19 disease? For example, was someone not able to go to school due to school closing? <single choice>

- Yes
- No
- Prefer not to answer

25-Was someone from your household affected by the COVID-19 disease? For example, was someone not able to travel, for example to Jimma? <single choice>

- Yes
- No
- Prefer not to answer

26-Was someone from your household affected by the COVID-19 disease? For example, was someone not able to leave the house due to COVID-19 related restrictions? <single choice>

- Yes
- No
- Prefer not to answer

27-Was someone from your household affected by the COVID-19 disease? For example, was someone not able to go to the market in the nearby village? <single choice>

- Yes
- No
- Prefer not to answer

28-Was there a major income shortfall due to COVID-19 during the years of 2012 and 2013 (Ethiopian calendar)? <single choice>

- Yes
- No
- Prefer not to answer

29-Was there an unexpectedly large expenditure due to COVID-19 during the years of 2012 and 2013 (Ethiopian calendar)? <single choice>

- Yes
- No
- Prefer not to answer

30-What are your sources of livelihood? <multiple choice>

- Crop cultivation
- Livestock

- Wage off-farm (e.g. remittance, owning a small shop, daily wage)
- Coffee cultivation
- Other forest products
- Prefer not to answer

31-If answer to 30 is not "prefer not to answer" and at least two options are selected, then: Please rank your sources of livelihood according to the importance of your livelihood. (1 = most important, 2 = secondly most important etc.)

- Crop cultivation <integer field, only if selected as answer in 30>
- Livestock <integer field, only if selected as answer in 30>
- Wage off-farm (e.g. remittance, owning a small shop, daily wage) <integer field, only if selected as answer in 30>
- Coffee cultivation <integer field, only if selected as answer in 30>
- Other forest products <integer field, only if selected as answer in 30>
- Prefer not to answer

32-Please indicate how much you agree with the following statement by pointing on the appropriate symbol: The land use of other people of my community (for example coffee production) has an impact on me. <integer field>

- Strongly disagree (symbol: big red cross, number: 1)
- Disagree (symbol: red cross, number: 2)
- Neither disagree nor agree (symbol: white circle, number: 3)
- Agree (symbol: green checkmark, number: 4)
- Strongly agree (symbol: big green checkmark, number: 5)
- Prefer not to answer

33-Please indicate how much you agree with the following statement by pointing on the appropriate symbol: When making a land use decision (for example coffee production), I consider the impact on other people of my community. <integer field>

- Strongly disagree (symbol: big red cross, number: 1)
- Disagree (symbol: red cross, number: 2)
- Neither disagree nor agree (symbol: white circle, number: 3)
- Agree (symbol: green checkmark, number: 4)
- Strongly agree (symbol: big green checkmark, number: 5)
- Prefer not to answer

34-Please indicate how much you agree with the following statement by pointing on the appropriate symbol: A natural forest managed for coffee production is more valuable for me than a natural forest without managed coffee. <integer field>

- Strongly disagree (symbol: big red cross, number: 1)
- Disagree (symbol: red cross, number: 2)
- Neither disagree nor agree (symbol: white circle, number: 3)
- Agree (symbol: green checkmark, number: 4)
- Strongly agree (symbol: big green checkmark, number: 5)
- Prefer not to answer

35-Please indicate how much you agree with the following statement by pointing on the appropriate symbol: A natural forest managed for coffee production is more valuable for the people in my community than a natural forest without managed coffee. <integer field>

- Strongly disagree (symbol: big red cross, number: 1)

- Disagree (symbol: red cross, number: 2)
- Neither disagree nor agree (symbol: white circle, number: 3)
- Agree (symbol: green checkmark, number: 4)
- Strongly agree (symbol: big green checkmark, number: 5)
- Prefer not to answer

36-Please indicate how much you agree with the following statement by pointing on the appropriate symbol: Belete forest management for coffee production is accepted by most people in my community. <integer field>

- Strongly disagree (symbol: big red cross, number: 1)
- Disagree (symbol: red cross, number: 2)
- Neither disagree nor agree (symbol: white circle, number: 3)
- Agree (symbol: green checkmark, number: 4)
- Strongly agree (symbol: big green checkmark, number: 5)
- Prefer not to answer

37-Please indicate how much you agree with the following statement by pointing on the appropriate symbol: I can influence the management decisions of the Belete forest. <integer field>

- Strongly disagree (symbol: big red cross, number: 1)
- Disagree (symbol: red cross, number: 2)
- Neither disagree nor agree (symbol: white circle, number: 3)
- Agree (symbol: green checkmark, number: 4)
- Strongly agree (symbol: big green checkmark, number: 5)
- Prefer not to answer

38-Please indicate how much you agree with the following statement by pointing on the appropriate symbol: People in my community help each other if they are in need. <integer field>

- Strongly disagree (symbol: big red cross, number: 1)
- Disagree (symbol: red cross, number: 2)
- Neither disagree nor agree (symbol: white circle, number: 3)
- Agree (symbol: green checkmark, number: 4)
- Strongly agree (symbol: big green checkmark, number: 5)
- Prefer not to answer

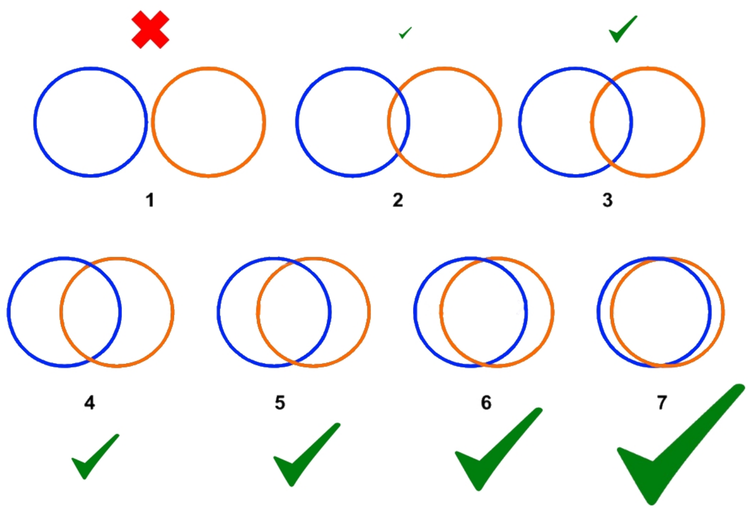
39-Please indicate how much you agree with the following statement by pointing on the appropriate symbol: Most people in my community can trust me. <integer field>

- Strongly disagree (symbol: big red cross, number: 1)
- Disagree (symbol: red cross, number: 2)
- Neither disagree nor agree (symbol: white circle, number: 3)
- Agree (symbol: green checkmark, number: 4)
- Strongly agree (symbol: big green checkmark, number: 5)
- Prefer not to answer

40-Please indicate how much you agree with the following statement by pointing on the appropriate symbol: I can trust most people in my community. <integer field>

- Strongly disagree (symbol: big red cross, number: 1)
- Disagree (symbol: red cross, number: 2)
- Neither disagree nor agree (symbol: white circle, number: 3)
- Agree (symbol: green checkmark, number: 4)
- Strongly agree (symbol: big green checkmark, number: 5)
- Prefer not to answer

41-Think about the game from earlier today. How do you consider your relationship with the other two members of your group? Please select the pair of circles that best describes your relationship. By selecting the appropriate number please indicate to what extent you and your group are connected. You are represented by the blue circle and the two members of your group are represented by the orange circle. <integer field>



42-Is your household enrolled in the REDD+ program? <single choice>

- Yes
- No
- Prefer not to answer

43-Was your household enrolled in the previous participatory forest management program (WaBuB)? <single choice>

- Yes
- No
- Prefer not to answer

2 Supplementary Figures

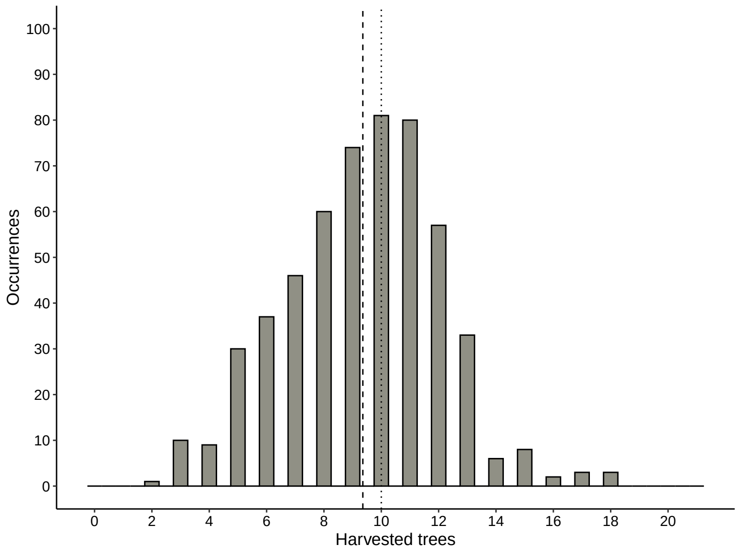


Figure SI-2: Histogram of harvested trees. The figure shows the histogram of all harvested trees per group across all groups, scenarios and rounds. The dashed line represents the mean value and the dotted line represents the median value.

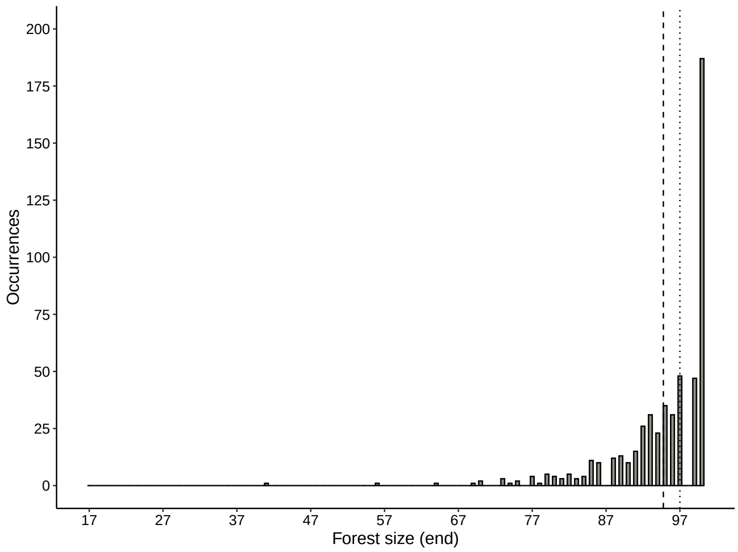


Figure SI-3: Histogram of forest size at the end of a round. The figure shows the histogram of all forest sizes at the end of a round across all groups, scenarios and rounds. The dashed line represents the mean value and the dotted line represents the median value.

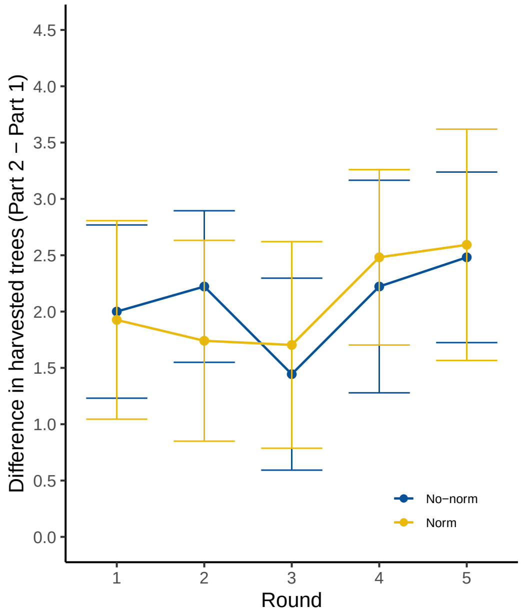


Figure SI-4: Average difference of harvested trees per condition between parts. The figure represents the average difference of harvested trees per group in the No-norm (blue) and Norm (yellow) conditions between both parts (Part 2 – Part 1). The bars indicate the 95% confidence interval. Pairwise comparisons between the differences in harvested trees in both conditions result in insignificant differences for each round (Wilcoxon rank sum tests, $p = 1$ two-sided, adjusted for multiple hypotheses testing using the Bonferroni method).

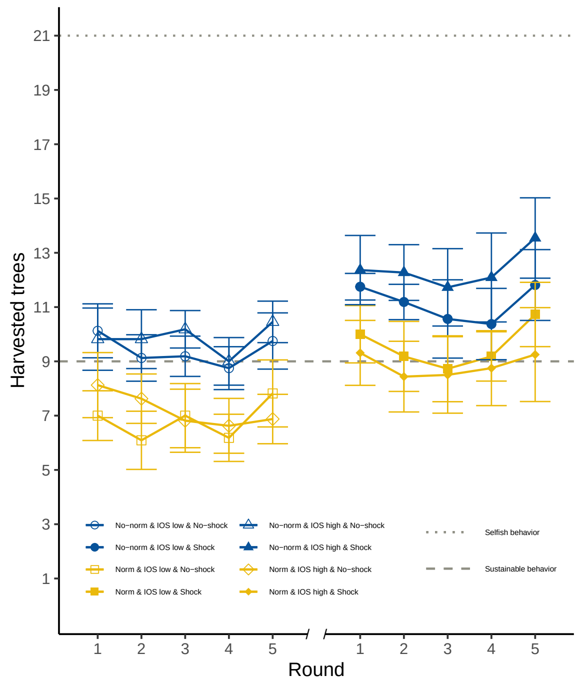


Figure SI-5: Average number of harvested trees per condition and with regard to IOS level. The figure represents the average number of harvested trees per group in the No-norm (blue) and Norm (yellow) conditions split into a high and low level of IOS before and during the income shock. The bars indicate the 95% confidence interval. The predicted outcomes given sustainable (selfish) behavior on a group level are depicted with dashed (dotted) lines. Sustainable behavior results in a harvest of the re-growth, i.e., 9 trees in each round. When all people in a given group act selfishly, they extract the maximum amount of 21 trees in each round.

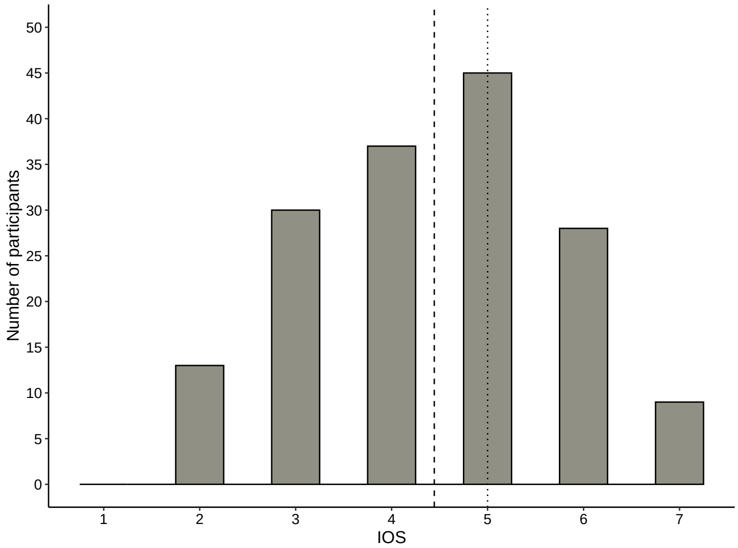


Figure SI-6: Histogram of self-reported IOS values for each participant. The figure displays the histogram of self-reported "Inclusion of the Other in the Self" (IOS) values (Gächter et al., 2015) for each participant with regard to the other two group members. IOS is measured on a 7-point Likert scale where 1 indicates "not close at all" and 7 indicates "very close". The dashed line represents the mean value and the dotted line represents the median value.

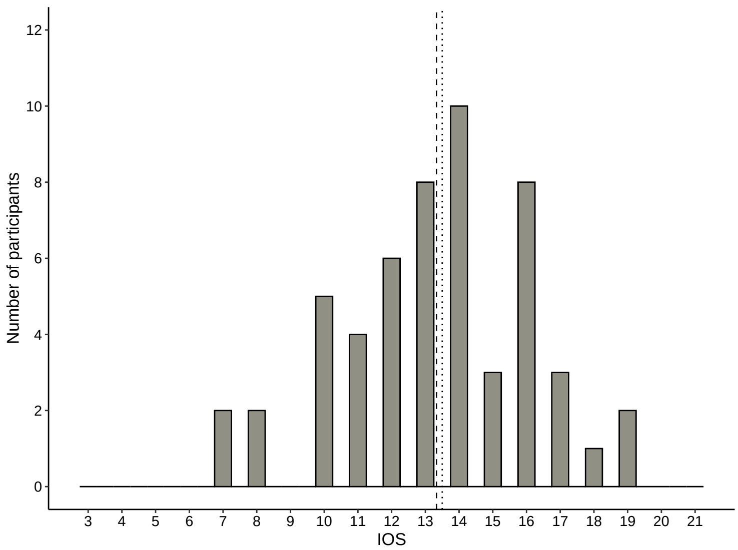


Figure SI-7: Histogram of aggregated IOS values for each group. The figure displays the histogram of the aggregated "Inclusion of the Other in the Self" (IOS) values (Gächter et al., 2015) for each group as the sum of the three individual IOS values of each group member. IOS on an individual level is measured on a 7-point Likert scale where 1 indicates "not close at all" and 7 indicates "very close". At the group level the range of values is multiplied by three. The dashed line represents the mean value and the dotted line represents the median value.

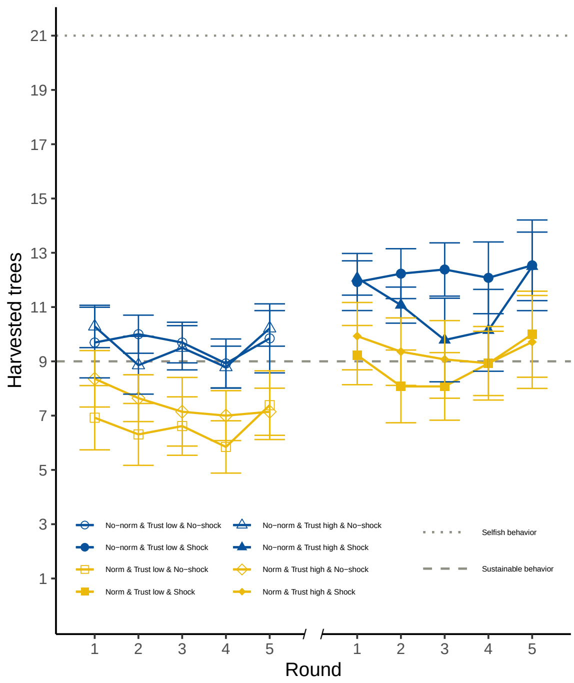


Figure SI-8: Average number of harvested trees per condition and with regard to trust level. The figure represents the average number of harvested trees per group in the No-norm (blue) and Norm (yellow) conditions split into a high and low level of trust before and during the income shock. The bars indicate the 95% confidence interval. The predicted outcomes given sustainable (selfish) behavior on a group level are depicted with dashed (dotted) lines. Sustainable behavior results in a harvest of the re-growth, i.e., 9 trees in each round. When all people in a given group act selfishly, they extract the maximum possible, i.e., 21 trees in each round.

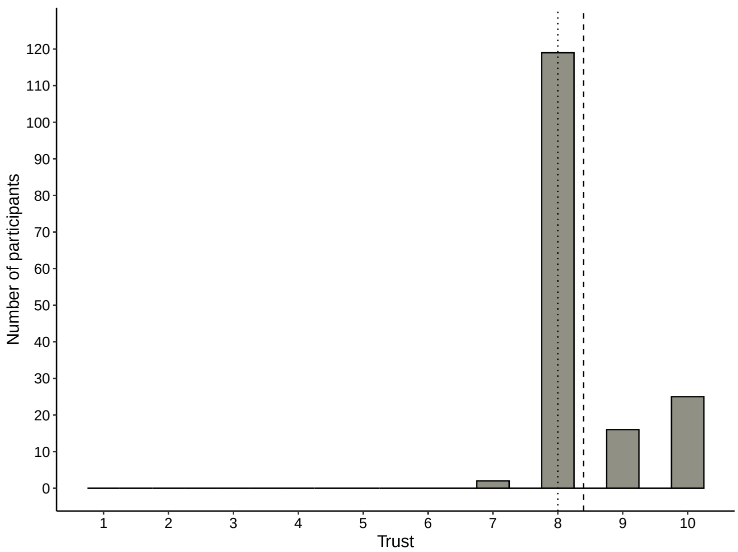


Figure SI-9: Histogram of self-reported trust values for each participant. The figure displays the histogram of self-reported trust values for each participant. Trust is measured by the answers to two statements given a 5-point Likert scale where 1 indicates "strongly disagree" and 5 indicates "strongly agree". The statements are: "Most people in my community can trust me." and "I can trust most people in my community." The dashed line represents the mean value and the dotted line represents the median value.

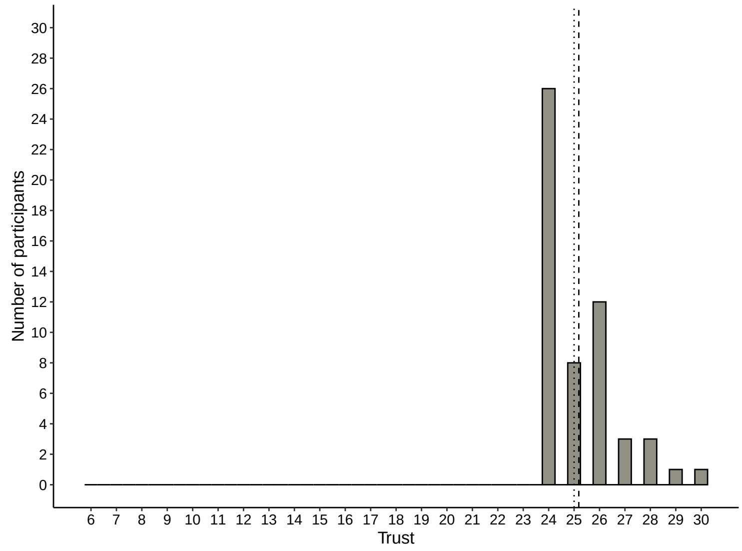


Figure SI-10: Histogram of aggregated trust values for each group. The figure displays the histogram of the aggregated trust values for each group as the sum of the three individual trust values of each group member. Trust on an individual level is measured on the answers to two statements given a 5-point Likert scale where 1 indicates "strongly disagree" and 5 indicates "strongly agree". The statements are: "Most people in my community can trust me." and "I can trust most people in my community." At the group level the range of values is multiplied by three. The dashed line represents the mean value and the dotted line represents the median value.

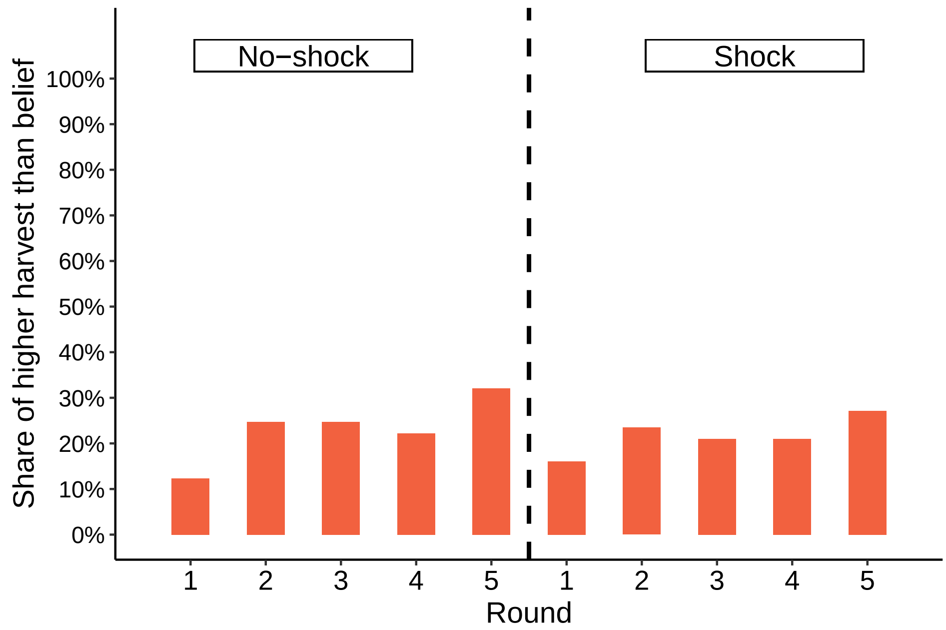


Figure SI-11: Share of participants who harvest more than their normative expectation. The figure presents the share of participants who harvest more than their belief for each round. The normative belief corresponds to the answer to the question "What do you believe is the maximum harvest from the community forest in this game that should generally be expected from every group member?" (adapted from Engel & Kurschilgen, 2020). The dashed line splits the rounds into the no-shock and shock scenarios. There is no significant difference for pairwise comparisons of the same round between scenarios (McNemar's Chi-squared test, $p = 1$ for each comparison, two-sided, corrected for multiple hypotheses testing) and when comparing the overall share of the no-shock (23.21%) and the shock (21.73%) condition (Wilcoxon signed rank test, $p = 0.6$, two-sided). Only data from the Norm condition is displayed.

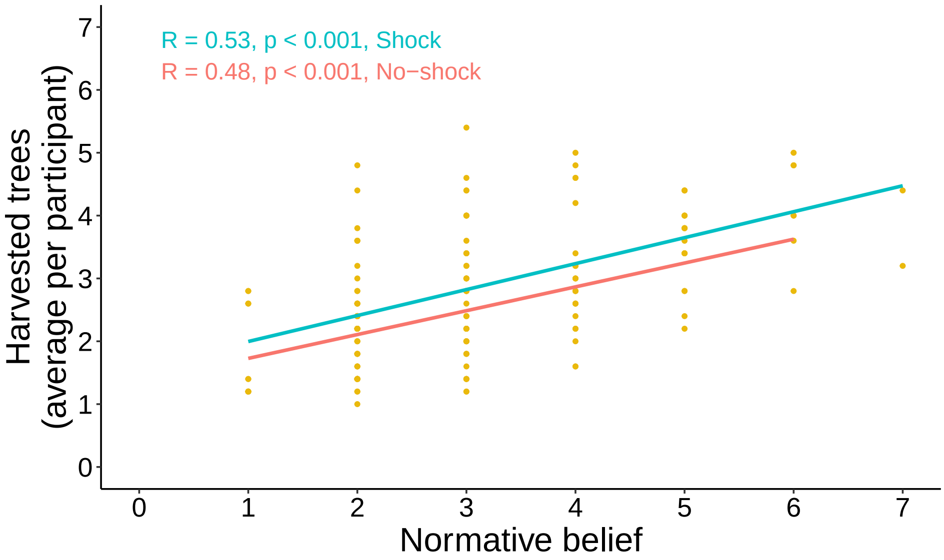


Figure SI-12: Correlation between harvested trees and normative belief. The figure shows the correlation between average harvested trees per participant per scenario and the participant's normative belief. The normative belief corresponds to the answer to the question "What do you believe is the maximum harvest from the community forest in this game that should generally be expected from every group member?" (adapted from Engel & Kurschilgen, 2020). Spearman's correlation coefficients are significant within each scenario. Only data from the NORM condition is displayed.

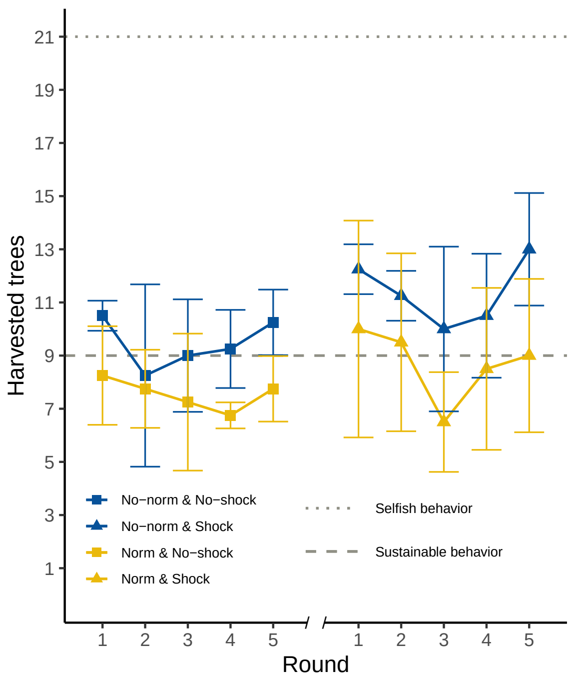


Figure SI-13: Average number of harvested trees per condition from participants in Gurati. The figure represents the average number of harvested trees per group in the NO-NORM (blue) and NORM (yellow) conditions from participants in Gurati (8 groups in total). The bars indicate the 95% confidence interval. The predicted outcomes given sustainable (selfish) behavior on a group level are depicted with dashed (dotted) lines. Sustainable behavior results in a harvest of the re-growth, i.e., 9 trees in each round. When all people in a given group act selfishly, they extract the maximum possible, i.e., 21 trees in each round.

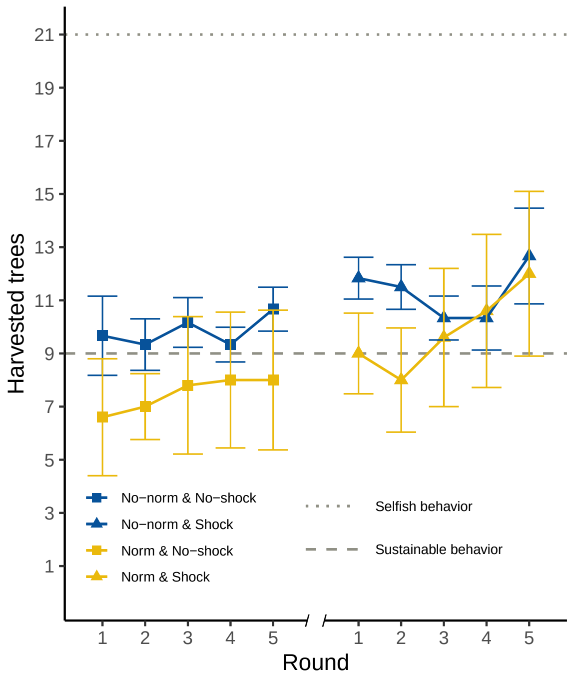


Figure SI-14: Average number of harvested trees per condition from participants in Debiye. The figure represents the average number of harvested trees per group in the No-norm (blue) and Norm (yellow) conditions from participants in Debiye (11 groups in total). The bars indicate the 95% confidence interval. The predicted outcomes given sustainable (selfish) behavior on a group level are depicted with dashed (dotted) lines. Sustainable behavior results in a harvest of the re-growth, i.e., 9 trees in each round. When all people in a given group act selfishly, they extract the maximum possible, i.e., 21 trees in each round.

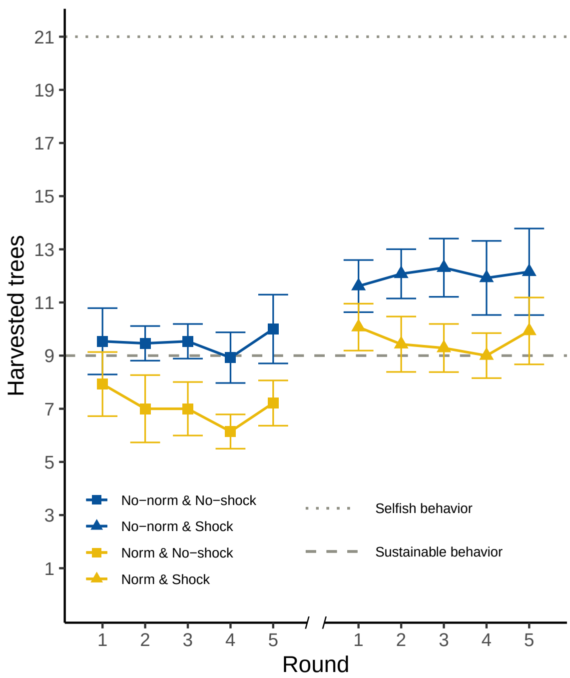


Figure SI-15: Average number of harvested trees per condition from participants in Kerteme. The figure represents the average number of harvested trees per group in the No-norm (blue) and Norm (yellow) conditions from participants in Kerteme (27 groups in total). The bars indicate the 95% confidence interval. The predicted outcomes given sustainable (selfish) behavior on a group level are depicted with dashed (dotted) lines. Sustainable behavior results in a harvest of the re-growth, i.e., 9 trees in each round. When all people in a given group act selfishly, they extract the maximum possible, i.e., 21 trees in each round.

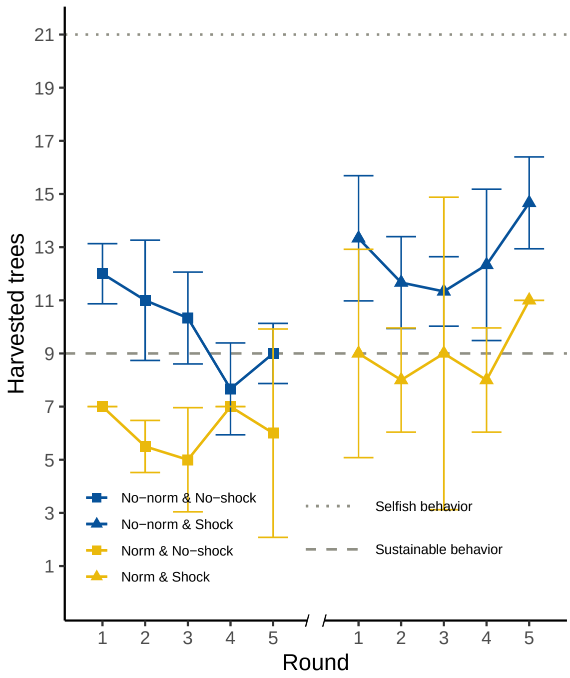


Figure SI-16: Average number of harvested trees per condition from participants in Meti-chafe. The figure represents the average number of harvested trees per group in the No-norm (blue) and Norm (yellow) conditions from participants in Meti-chafe (5 groups in total). The bars indicate the 95% confidence interval. The predicted outcomes given sustainable (selfish) behavior on a group level are depicted with dashed (dotted) lines. Sustainable behavior results in a harvest of the re-growth, i.e., 9 trees in each round. When all people in a given group act selfishly, they extract the maximum possible, i.e., 21 trees in each round.

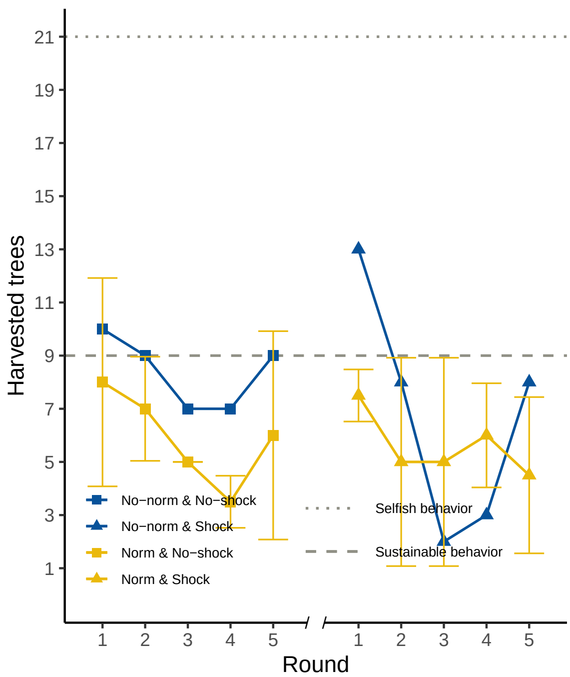


Figure SI-17: Average number of harvested trees per condition from participants in Sokii. The figure represents the average number of harvested trees per group in the No-norm (blue) and Norm (yellow) conditions from participants in Sokii (3 groups in total). The bars indicate the 95% confidence interval. The predicted outcomes given sustainable (selfish) behavior on a group level are depicted with dashed (dotted) lines. Sustainable behavior results in a harvest of the re-growth, i.e., 9 trees in each round. When all people in a given group act selfishly, they extract the maximum possible, i.e., 21 trees in each round.

3 Supplementary Tables

Table SI-1: Sample characteristics with difference tests in means between conditions

	Full Sample		No-norm		Norm		p-value
	Mean	SD	Mean	SD	Mean	SD	
Age	41,13	14,47	40,81	14,61	41,44	14,41	0,562^{w}
Education	2,83	1,21	2,78	1,30	2,89	1,12	0,675^{w}
Muslim	0,85	0,36	0,88	0,33	0,83	0,38	0,528^{c}
Oromo	0,77	0,42	0,81	0,39	0,73	0,45	0,261^{c}
Origin	0,83	0,37	0,85	0,36	0,81	0,39	0,673^{c}
Adults (household)	2,79	1,23	2,73	1,16	2,85	1,30	0,665^{w}
Children (household)	2,85	1,78	2,84	1,78	2,85	1,79	0,884^{w}
Land-use (area)	1,49	1,55	1,59	1,63	1,39	1,47	0,177^{w}
Land-use (other)	3,93	0,58	4,01	0,40	3,85	0,71	0,131^{w}
Land-use (own)	2,81	1,12	2,99	1,18	2,64	1,03	0,055^{w}
LHS (coffee)	0,94	0,24	0,94	0,24	0,94	0,24	1,000^{c}
LHS (crops)	0,81	0,39	0,88	0,33	0,75	0,43	0,069^{c}
LHS (OFP)	0,51	0,50	0,57	0,50	0,46	0,50	0,209^{c}
LHS (livestock)	0,65	0,48	0,69	0,46	0,60	0,49	0,324^{c}
LHS (wage)	0,44	0,50	0,41	0,49	0,47	0,50	0,526^{c}
LHI (coffee)	0,81	0,39	0,86	0,35	0,76	0,43	0,216^{c}
LHI (crops)	0,08	0,28	0,07	0,26	0,10	0,30	0,792^{c}
LHI (OFP)	0,12	0,33	0,07	0,25	0,18	0,39	0,207^{c}
LHI (livestock)	0,02	0,14	0,00	0,00	0,04	0,20	0,417^{c}
LHI (wage)	0,21	0,41	0,24	0,43	0,19	0,40	0,854^{c}
CM (acceptance)	4,41	0,61	4,40	0,65	4,43	0,57	0,813^{w}
CM (other)	4,20	0,50	4,19	0,48	4,21	0,52	0,694^{w}
CM (own)	4,14	0,56	4,14	0,52	4,14	0,61	0,780^{w}
CS (cultivation)	0,60	0,49	0,54	0,50	0,65	0,48	0,199^{w}
CS (harvesting)	0,56	0,50	0,54	0,50	0,57	0,50	0,874^{w}
FM (influence)	3,66	0,88	3,77	0,78	3,56	0,96	0,138^{w}
PFM	0,80	0,40	0,83	0,38	0,78	0,42	0,554^{c}
REDD+	0,20	0,40	0,21	0,41	0,19	0,40	0,939^{c}
Help (percentage)	0,37	0,26	0,40	0,27	0,34	0,25	0,089^{w}
Help (Likert)	4,20	0,40	4,19	0,39	4,22	0,42	0,561^{w}
Trust	8,40	0,76	8,42	0,82	8,37	0,70	0,917^{w}
IOS	4,44	1,34	4,32	1,25	4,57	1,41	0,280^{w}
C19 (expenditure)	0,99	0,08	1,00	0,00	0,99	0,11	1,000^{c}
C19 (shortfall)	0,96	0,19	0,96	0,19	0,96	0,19	1,000^{c}
C19 (house)	0,01	0,08	0,01	0,11	0,00	0,00	1,000^{c}
C19 (infection)	0,00	0,00	0,00	0,00	0,00	0,00	1,000^{c}
C19 (market)	0,01	0,11	0,01	0,11	0,01	0,11	1,000^{c}
C19 (school)	0,99	0,08	1,00	0,00	0,99	0,11	1,000^{c}
C19 (travel)	0,04	0,20	0,04	0,19	0,05	0,22	1,000^{c}
C19 (work)	0,02	0,14	0,01	0,11	0,02	0,16	1,000^{c}

Notes: The table reports means and standard deviations (SD) for individual characteristics for the full sample and for each condition. The p-values follow two-sided Wilcoxon rank sum tests (indicated by ^{w}) or χ^2-tests (indicated by ^{c}). The replication package at OSF contains a detailed variable list. LHS refers to livelihood strategy (whether this is part or not). LHI refers to livelihood importance (whether this is the most important livelihood strategy or not). OFP refers to other forest products. CM refers to coffee management. CS refers to coffee sharing (whether this is done with others or alone). FM refers to forest management. $C19$ refers to COVID-19.

Table SI-2: Pairwise comparisons of harvest rate and forest size between conditions

	No-norm		Norm		p-value
	Mean	SD	Mean	SD	
Harvest (Part 1, Round 1)	10.00	1.96	7.67	2.17	0.003
Harvest (Part 1, Round 2)	9.41	1.78	7.00	1.96	<0.001
Harvest (Part 1, Round 3)	9.59	1.45	6.89	2.19	<0.001
Harvest (Part 1, Round 4)	8.85	1.54	6.44	1.83	<0.001
Harvest (Part 1, Round 5)	10.04	1.83	7.26	1.97	<0.001
Harvest (Part 2, Round 1)	12.00	1.57	9.59	2.19	<0.001
Harvest (Part 2, Round 2)	11.63	1.57	8.74	2.46	<0.001
Harvest (Part 2, Round 3)	11.04	2.75	8.59	2.53	0.005
Harvest (Part 2, Round 4)	11.07	2.80	8.93	2.35	0.033
Harvest (Part 2, Round 5)	12.52	2.69	9.85	3.05	0.006
Forest (Part 1, Round 1)	98.07	1.80	99.56	0.97	0.005
Forest (Part 1, Round 2)	97.00	2.76	99.33	1.57	<0.001
Forest (Part 1, Round 3)	95.44	3.56	99.22	1.65	<0.001
Forest (Part 1, Round 4)	94.41	4.30	99.33	1.57	<0.001
Forest (Part 1, Round 5)	92.19	5.47	99.56	1.12	<0.001
Forest (Part 2, Round 1)	96.11	1.74	98.52	1.93	<0.001
Forest (Part 2, Round 2)	92.44	2.98	97.41	3.47	<0.001
Forest (Part 2, Round 3)	89.07	5.45	96.22	4.28	<0.001
Forest (Part 2, Round 4)	85.07	8.17	94.70	5.49	<0.001
Forest (Part 2, Round 5)	79.33	11.24	92.26	7.16	<0.001

Notes: The table reports means and standard deviations (SD) for harvest rates and forest sizes at the end of the round for each condition. The p-values follow two-sided Wilcoxon rank sum tests and are adjusted for multiple hypotheses testing using the Bonferroni method.

Table SI-3: Pairwise comparisons of harvest rate and forest size within conditions

	Part 1		Part 2		p-value
	Mean	SD	Mean	SD	
Harvest (No-norm, Round 1)	10.00	1.96	12.00	1.57	0.001
Harvest (No-norm, Round 2)	9.41	1.78	11.63	1.57	<0.001
Harvest (No-norm, Round 3)	9.59	1.45	11.04	2.75	0.014
Harvest (No-norm, Round 4)	8.85	1.54	11.07	2.80	0.002
Harvest (No-norm, Round 5)	10.04	1.83	12.52	2.69	<0.001
Harvest (Norm, Round 1)	7.67	2.17	9.59	2.19	0.004
Harvest (Norm, Round 2)	7.00	1.96	8.74	2.46	0.005
Harvest (Norm, Round 3)	6.89	2.19	8.59	2.53	0.008
Harvest (Norm, Round 4)	6.44	1.83	8.93	2.35	<0.001
Harvest (Norm, Round 5)	7.26	1.97	9.85	3.05	0.001
Forest (No-norm, Round 1)	98.07	1.80	96.11	1.74	0.001
Forest (No-norm, Round 2)	97.00	2.76	92.44	2.98	<0.001
Forest (No-norm, Round 3)	95.44	3.56	89.07	5.45	<0.001
Forest (No-norm, Round 4)	94.41	4.30	85.07	8.17	<0.001
Forest (No-norm, Round 5)	92.19	5.47	79.33	11.24	<0.001
Forest (Norm, Round 1)	99.56	0.97	98.52	1.93	0.045
Forest (Norm, Round 2)	99.33	1.57	97.41	3.47	0.018
Forest (Norm, Round 3)	99.22	1.65	96.22	4.28	0.004
Forest (Norm, Round 4)	99.33	1.57	94.70	5.49	0.001
Forest (Norm, Round 5)	99.56	1.12	92.26	7.16	<0.001

Notes: The table reports means and standard deviations (SD) for harvest rates and forest sizes at the end of the round for each part. The p-values follow two-sided Wilcoxon rank sum tests and are adjusted for multiple hypotheses testing using the Bonferroni method.

Table SI-4: Effect of social norm and shock treatments on harvest level and forest size

	Dependent variable:			
	Harvest (group)		Forest size (end)	
	(1)	(2)	(3)	(4)
Constant	9.58***	4.31	95.42***	109.54***
	(0.22)	(4.32)	(0.63)	(10.16)
Norm	−2.53***	−2.64***	3.98***	4.37***
	(0.33)	(0.34)	(0.66)	(0.72)
Shock	2.07***	2.07***	−7.01***	−7.01***
	(0.25)	(0.25)	(0.74)	(0.75)
Norm x Shock	0.01	0.01	3.44***	3.44***
	(0.39)	(0.40)	(1.03)	(1.04)
Session		0.04**		−0.06*
		(0.01)		(0.03)
Endgame		1.49***		−1.01***
		(0.27)		(0.23)
Round		−0.31***		−1.56***
		(0.10)		(0.22)
IOS		0.11		−0.43*
		(0.08)		(0.19)
Trust		0.14		−0.08
		(0.16)		(0.40)
F Statistic	52.35***	32.28***	44.21***	22.09***
Observations	540	540	540	540
Adjusted R^2	0.30	0.34	0.29	0.50

Notes: The table reports coefficient estimates from random effects models. The dependent variable is the harvest on the group level in Columns (1) and (2), and the forest size at the end of a round in Columns (3) and (4). Heteroskedasticity- and autocorrelation-consistent standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

Table SI-5: Effect of social norm treatment on harvest level and forest size separated by scenario

	Harvest (group)		Forest size (end)	
	No-shock	Shock	No-shock	Shock
	(1)	(2)	(3)	(4)
Constant	6.20	4.48	94.85***	117.21***
	(3.66)	(5.88)	(7.14)	(14.98)
Norm	−2.61***	−2.66***	4.27***	7.91***
	(0.32)	(0.50)	(0.65)	(1.35)
Session	0.02	0.05**	−0.01	−0.11**
	(0.01)	(0.02)	(0.03)	(0.04)
Endgame	1.30***	1.68***	−0.26	−1.76***
	(0.32)	(0.37)	(0.23)	(0.35)
Round	−0.35**	−0.28*	−0.67***	−2.46***
	(0.12)	(0.12)	(0.15)	(0.32)
IOS	0.10	0.13	−0.31**	−0.54
	(0.07)	(0.10)	(0.12)	(0.29)
Trust	0.10	0.18	0.28	−0.44
	(0.13)	(0.22)	(0.27)	(0.60)
F Statistic	13.02***	9.96***	8.42***	17.26***
Observations	270	270	270	270
Adjusted R^2	0.21	0.16	0.29	0.53

Notes: The table reports coefficient estimates from random effects models. The dependent variable is the harvest on the group level in Columns (1) and (2), and the forest size at the end of a round in Columns (3) and (4). The sample consists only of the No-shock scenario in Columns (1) and (3) and only of the Shock scenario in Columns (2) and (4). Heteroskedasticity- and autocorrelation-consistent standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

Table SI-6: Effect of social norm treatment on harvest level and forest size using a Tobit model

	Dependent variable:			
	Harvest (group)		Forest size (end)	
	(1)	(2)	(3)	(4)
Constant	9.58***	4.31	96.34***	120.81***
	(0.22)	(4.36)	(0.86)	(14.66)
Norm	−2.53***	−2.64***	10.08***	9.93***
	(0.33)	(0.34)	(1.98)	(1.86)
Shock	2.07***	2.07***	−7.86***	−7.85***
	(0.25)	(0.25)	(0.84)	(0.86)
Norm x Shock	0.01	0.01	−0.74	−0.27
	(0.40)	(0.40)	(1.55)	(1.50)
Session		0.04*		−0.10
		(0.01)		(0.05)
Endgame		1.49***		−0.97*
		(0.27)		(0.43)
Round		−0.31**		−2.05***
		(0.10)		(0.30)
IOS		0.11		−0.57*
		(0.08)		(0.29)
Trust		0.14		−0.32
		(0.16)		(0.54)
Observations	540	540	540	540
Log Likelihood	−1,190.02	−1,161.94	−1,315.39	−1,247.18
Wald Test	299.96***	391.99***	271.16***	474.44***
	(df = 3)	(df = 8)	(df = 3)	(df = 8)

Notes: The table reports coefficient estimates from Tobit models. The dependent variable is the harvest on the group level in Columns (1) and (2), and the forest size at the end of a round in Columns (3) and (4). Clustered-robust standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

Table SI-7: Effect of social norm and shock treatments on individual harvest levels

	Dependent variable: Harvest (individual)			
	(1)	(2)	(3)	(4)
Constant	3.19^{***}	2.73^{***}	4.18^{***}	4.80^{***}
	(0.08)	(0.74)	(0.94)	(0.99)
Norm	-0.84^{***}	-0.87^{***}	-0.79^{***}	-0.96^{***}
	(0.12)	(0.12)	(0.12)	(0.11)
Shock	0.69^{***}	0.69^{***}	0.70^{***}	0.71^{***}
	(0.08)	(0.08)	(0.09)	(0.09)
Norm x Shock	0.005	0.005	−0.004	0.01
	(0.13)	(0.13)	(0.13)	(0.13)
Session		0.01^{*}	0.01^{**}	0.02^{***}
		(0.005)	(0.01)	(0.01)
Endgame		0.50^{***}	0.49^{***}	0.50^{***}
		(0.07)	(0.08)	(0.08)
Round		-0.10^{***}	-0.10^{***}	-0.09^{***}
		(0.03)	(0.03)	(0.03)
IOS		0.05	0.03	0.06
		(0.05)	(0.05)	(0.05)
Trust		0.03	0.07	0.01
		(0.08)	(0.08)	(0.05)
Education			−0.09	−0.08
			(0.05)	(0.05)
Origin			0.08	0.14
			(0.23)	(0.24)
Age			-0.06^{**}	-0.07^{**}
			(0.02)	(0.02)
Age^2			0.001^{**}	0.001^{**}
			(0.0002)	(0.0002)
Muslim			−0.06	−0.28
			(0.19)	(0.19)
Oromo			0.53^{**}	0.52^{***}
			(0.18)	(0.15)

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Table SI-7: Effect of social norm and shock treatments on individual harvest levels (continued from previous page)

	Dependent variable: Harvest (individual)			
	(1)	(2)	(3)	(4)
Help (Likert)			−0.16	−0.19
			(0.15)	(0.13)
Adults (household)				0.10*
				(0.05)
Children (household)				−0.02
				(0.04)
Land-use (area)				−0.03
				(0.04)
Land-use (own)				0.04
				(0.05)
Land-use (other)				−0.10
				(0.10)
CM (own)				0.29***
				(0.08)
CM (other)				−0.19
				(0.13)
CM (acceptance)				0.18*
				(0.09)
FM (influence)				−0.29***
				(0.06)
PFM				0.06
				(0.15)
REDD+				0.39**
				(0.15)
F Statistic	54.69***	31.86***	21.93***	23.94***
Observations	1,620	1,620	1,610	1,560
Adjusted R^2	0.15	0.17	0.17	0.20

Notes: The table reports coefficient estimates random effects models. The dependent variable is the harvest on the individual farmer level. Heteroskedasticity- and autocorrelation-consistent standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

Table SI-8: Effect of trust on group harvest levels

	Dependent variable: Harvest (group)					
	No-norm		Norm		Full sample	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	9.63***	20.29***	6.62***	10.45	9.63***	14.00***
	(0.36)	(3.57)	(0.39)	(5.52)	(0.36)	(2.52)
Trust	−0.10	0.59	0.84	1.52*	−0.10	0.64
	(0.44)	(0.56)	(0.47)	(0.66)	(0.44)	(0.49)
Shock	2.60***	1.97***	2.25***	2.16***	2.60***	2.29***
	(0.33)	(0.21)	(0.40)	(0.42)	(0.33)	(0.24)
Trust x Shock	−1.01*	−0.85*	−0.30	−0.35	−1.01*	−0.93*
	(0.46)	(0.37)	(0.60)	(0.57)	(0.46)	(0.41)
Session		0.03		0.04*		0.04**
		(0.02)		(0.02)		(0.01)
Endgame		0.06		0.48		0.46
		(0.44)		(0.36)		(0.27)
Forest (start)		−0.12**		−0.05		−0.06*
		(0.04)		(0.06)		(0.03)
Norm					−3.02***	−2.86***
					(0.53)	(0.49)
Trust x Norm					0.94	0.82
					(0.65)	(0.60)
Norm x Shock					−0.35	−0.14
					(0.52)	(0.45)
Trust x Norm x Shock					0.71	0.58
					(0.76)	(0.70)
F Statistic	28.71***	25.39***	16.78***	14.33***	26.04***	23.52***
Observations	270	270	270	270	540	540
Adjusted R^2	0.30	0.33	0.24	0.25	0.30	0.37

Notes: The table reports coefficient estimates from random effects models. The dependent variable is the harvest on the group level. Only data from the No-norm condition is displayed in Columns (1) and (2). Only data from the Norm condition is displayed in Columns (3) and (4). Columns (5) and (6) contain the full sample. Heteroskedasticity- and autocorrelation-consistent standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

Table SI-9: Effect of relationship closeness among group members on group harvest levels

	Dependent variable: Harvest (group)					
	No-norm		Norm		Full sample	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	9.39***	19.34***	6.82***	12.39*	9.39***	14.23***
	(0.31)	(3.38)	(0.33)	(5.79)	(0.31)	(2.43)
IOS	0.47	0.44	0.39	0.63	0.47	0.47
	(0.41)	(0.33)	(0.48)	(0.55)	(0.41)	(0.36)
Shock	1.75***	1.32***	2.75***	2.58***	1.75***	1.52***
	(0.30)	(0.32)	(0.41)	(0.42)	(0.30)	(0.31)
IOS x Shock	0.80	0.64	−1.11	−1.06*	0.80	0.71
	(0.50)	(0.40)	(0.57)	(0.54)	(0.50)	(0.44)
Session		0.03*		0.02		0.03*
		(0.01)		(0.01)		(0.01)
Endgame		0.13		0.46		0.47
		(0.41)		(0.37)		(0.26)
Forest (start)		−0.11***		−0.06		−0.06*
		(0.03)		(0.06)		(0.02)
Norm					−2.57***	−2.68***
					(0.46)	(0.46)
IOS x Norm					−0.07	0.29
					(0.63)	(0.60)
Norm x Shock					1.00	1.07*
					(0.51)	(0.49)
IOS x Norm x Shock					−1.90*	−1.78*
					(0.75)	(0.69)
F Statistic	26.64***	30.20***	26.63***	16.18***	26.09***	24.29***
Observations	270	270	270	270	540	540
Adjusted R^2	0.30	0.35	0.25	0.25	0.31	0.37

Notes: The table reports coefficient estimates from random effects models. The dependent variable is the harvest on the group level. Only data from the No-norm condition is displayed in Columns (1) and (2). Only data from the Norm condition is displayed in Columns (3) and (4). Columns (5) and (6) contain the full sample. Heteroskedasticity- and autocorrelation-consistent standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

Table SI-10: Treatment effects for each sub-village

	Dependent variable: Harvest (group)						
	Gurati		Debiye		Kerteme		Meti-chafe
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	9.45***	18.20***	9.83***	11.13	9.49***	18.75***	10.00***
	(0.76)	(4.64)	(0.18)	(9.23)	(0.36)	(4.50)	(0.35)
Norm	−1.90*	−1.65**	−2.35*	−2.61*	−2.44***	−2.35***	−3.90***
	(0.88)	(0.54)	(0.93)	(1.09)	(0.45)	(0.36)	(0.42)
Shock	1.95***	1.55**	1.50***	1.52***	2.52***	1.95***	2.67***
	(0.45)	(0.52)	(0.25)	(0.41)	(0.34)	(0.19)	(0.54)
Norm x Shock	−0.80	−0.70	0.86	0.85	−0.04	0.30	0.23
	(1.08)	(0.93)	(0.63)	(0.72)	(0.45)	(0.32)	(1.37)
Session		0.27*		−0.07		0.03*	
		(0.14)		(0.09)		(0.02)	
Endgame		0.57		1.52**		−0.10	
		(0.52)		(0.47)		(0.48)	
Forest (start)		−0.10*		0.005		−0.11*	
		(0.05)		(0.08)		(0.04)	
F Statistic	11.77**	15.70***	19.23***	12.01***	42.89***	41.87***	18.46***
Observations	80	80	110	110	270	270	50
Adjusted R^2	0.18	0.33	0.27	0.36	0.40	0.49	0.46

Notes: The table reports coefficient estimates from random effects models. The dependent variable is the harvest on the group level. Due to the small number of observations, the model could not be estimated for Meti-chafe (5 groups) when including game characteristics as well as for Sokii (3 groups). Heteroskedasticity- and autocorrelation-consistent standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

Table SI-11: Impact of livelihood sources on belief

	Dependent variable: Belief					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	2.85***	2.66***	2.58***	2.40***	2.70***	2.53***
	(0.26)	(0.20)	(0.18)	(0.22)	(0.17)	(0.51)
Crop cultivation	−0.28					−0.38
	(0.30)					(0.35)
Livestock		−0.02				0.21
		(0.26)				(0.34)
Wage off-farm			0.13			0.12
			(0.25)			(0.28)
Coffee cultivation				0.26		0.32
				(0.26)		(0.31)
Other forest products					−0.14	−0.18
					(0.25)	(0.26)
Observations	81	81	81	81	81	81
R^2	0.01	0.0001	0.003	0.003	0.004	0.03

Notes: The table reports coefficient estimates from OLS models. The dependent variable is the answer to the normative belief question "What do you believe is the maximum harvest from the community forest in this game that should generally be expected from every group member?" (adapted from Engel & Kurschilgen, 2020). Only data from the belief elicitation in Part 1 is displayed. Robust standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

Table SI-12: Factors influencing the belief

	Dependent variable: Belief			
	(1)	(2)	(3)	(4)
Constant	2.75**	2.46***	2.42***	2.70*
	(1.07)	(0.38)	(0.20)	(1.09)
Education	−0.07			−0.08
	(0.11)			(0.12)
Origin	0.50			0.51
	(0.29)			(0.36)
Age	0.01			0.02
	(0.04)			(0.06)
Age^2	−0.0001			−0.0002
	(0.0004)			(0.001)
Muslim	−1.06***			−1.48***
	(0.29)			(0.27)
Oromo	0.31			0.42
	(0.36)			(0.33)
Adults (household)		0.09		0.08
		(0.08)		(0.11)
Children (household)		−0.02		0.003
		(0.07)		(0.10)
Land-use (area)		−0.01		−0.12
		(0.08)		(0.09)
REDD+			0.27	0.47
			(0.32)	(0.32)
PFM			0.16	−0.12
			(0.24)	(0.29)
Observations	81	81	77	77
R^2	0.12	0.01	0.01	0.21

Notes: The table reports coefficient estimates from OLS models. The dependent variable is the answer to the normative belief question "What do you believe is the maximum harvest from the community forest in this game that should generally be expected from every group member?" (adapted from Engel & Kurschilgen, 2020). Only data from the belief elicitation in Part 1 is displayed. Robust standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

Table SI-13: Effect of beliefs on harvest level (individual)

	Dependent variable: Harvest (individual)				
	(1)	(2)	(3)	(4)	(5)
Constant	1.24***	1.18	0.02	1.74	0.05
	(0.24)	(2.41)	(2.29)	(1.92)	(2.10)
Normative belief	0.42***	0.42***	1.14*	1.11*	1.19**
	(0.08)	(0.08)	(0.56)	(0.49)	(0.46)
Shock	0.39	0.38	0.35	0.45	0.59*
	(0.29)	(0.29)	(0.29)	(0.30)	(0.28)
Normative belief x Shock	−0.02	−0.02	−0.01	−0.03	−0.08
	(0.09)	(0.09)	(0.09)	(0.09)	(0.08)
Session		0.01	0.003	0.01	0.02***
		(0.004)	(0.005)	(0.01)	(0.004)
Endgame		0.19	0.18	0.18	0.16
		(0.12)	(0.12)	(0.12)	(0.12)
Forest (start)		−0.001	−0.005	−0.01	−0.02
		(0.02)	(0.02)	(0.02)	(0.02)
IOS			−0.02	0.01	0.05
			(0.06)	(0.05)	(0.04)
Trust			0.20	0.25	0.27
			(0.24)	(0.22)	(0.21)
Normative belief x Trust			−0.09	−0.09	−0.09
			(0.07)	(0.06)	(0.05)
Education				−0.16**	−0.09
				(0.05)	(0.06)
Origin				0.22	0.16
				(0.16)	(0.19)
Age				−0.04	−0.07***
				(0.02)	(0.02)
Age^2				0.0004	0.001**
				(0.0002)	(0.0002)
Muslim				0.31	0.45*
				(0.20)	(0.22)
Oromo				0.59*	0.39
				(0.24)	(0.20)
Help (Likert)				−0.40*	−0.03
				(0.16)	(0.15)

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Table SI-13: Effect of beliefs on harvest level (individual) (continued from previous page)

	Dependent variable: Harvest (individual)				
	(1)	(2)	(3)	(4)	(5)
Adults (household)					0.13^{*}
					(0.05)
Children (household)					−0.03
					(0.03)
Land-use (area)					0.07
					(0.06)
Land-use (own)					0.13^{**}
					(0.05)
Land-use (other)					−0.04
					(0.07)
CM (own)					0.35^{***}
					(0.08)
CM (other)					-0.34^{*}
					(0.15)
CM (acceptance)					0.29^{**}
					(0.11)
FM (influence)					-0.19^{**}
					(0.06)
F Statistic	53.45***	32.63***	26.68***	40.40***	231.96***
Observations	810	810	810	810	810
Adjusted R^2	0.19	0.20	0.20	0.25	0.33

Notes: The table reports coefficient estimates from random effects models. The dependent variable is the harvest on the individual level. Heteroskedasticity- and autocorrelation-consistent standard errors are in parentheses. Levels of significance: *p<0.05, **p<0.01, ***p<0.001.

4 Supplementary References

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