Experiments to inform the design of payments for ecosystem services in Uganda

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Background

Tropical deforestation threatens biodiversity, carbon storage, watershed function and rural livelihoods. Forest loss is particularly acute in sub-Saharan Africa, where deforestation rates are the highest in the world (MacDicken et al. 2016). Between 2000 and 2020, total tree cover in Uganda decreased by 12% and accounted for 43 the release of 413 Mt of CO_2 emissions (Global Forest Watch 2021).

As policymakers commit to the fight against climate change, they continue to struggle with designing effective policy to combat deforestation. Payments for ecosystem services (PES) programs, which compensate landowners for conservation activities on their own land, have been heralded as a win-win market solution to the challenge of ecosystem conservation.

It has now been well established that trading money for forest conservation can lead to conserved forest (see Miteva et al. (2015) and Alix-Garcia and Wolff (2014) for full reviews of the literature). However, the results of both Jayachandran et al. (2017) in Uganda and Alix-Garcia et al. (2015) in Mexico reveal an important fact: these programs are only 50% effective, and deforestation continues in enrolled properties.

Until now, the vast majority of PES schemes in developing countries have used fixed payment rates per hectare, and it is unclear if these payments are set at the correct level to attract land at high risk of deforestation. One method for aligning payment levels more closely with lost production and program implementation costs is to allow program applicants to define an appropriate payment level through a voluntary auction mechanism. While such mechanisms are used in Australia, Tasmania, the U.S., and in a few experiments, to date, no such mechanism has been used to avoid deforestation in developing countries, where deforestation risk is highest.

In low-income countries, experimental auctions for tree-planting (not avoided deforestation) have been conducted in Tanzania (Jindal et al. 2013) and Malawi (Jack 2013), and for soil conservation investments in Indonesia (Jack et al. 2008). These cases reveal significant variation in prices that producers are willing to accept, information which, if combined with estimates of deforestation risk, could aid significantly in targeting payments to the land at highest risk of deforestation for the lowest cost. Auctions possess the additional advantage of providing a mechanism through which the social costs of environmental programs like PES can be assessed.

At the same time, it is well established that land tenure institutions have an important bearing on land use decisions (Ostram 2009), and, in particular, on environmental outcomes such as deforestation (Robsinson, Holland, and Naughton-Treves 2014; Tseng et al. 2021). Recent evidence from Uganda suggests that a particular form of historical land tenure, known as mailo land, has a deleterious impact on long-run forest outcomes (Walker et al. 2022). Mailo land represents a distinct form of tenure wherein owners and occupants share overlapping, and often undocumented, rights to land use, in a hybrid of the traditional customary and modern private ownership systems. Recent evidence suggests that, relative to other tenure structures (i.e., traditional customary practices and private ownership), mailo land tenure is associated with greater land tenure insecurity and poor investment outcomes (Deininger and Ali 2008).

A rich literature points to the importance of historical institutions in shaping culture, economic behavior, and preferences (see Alesina and Giulino 2015 for a review). In particular, it has been shown that improving the security of land tenure institutions can impact environmental outcomes (Holland et al. 2017; Baragwanath and Bayi 2020; Welez et al. 2020; Goldstein et al. 2018) and economic preferences, such as market beliefs and trust (Di Tella, Galiani, and Schargrodsky, 2007; Fabbri, 2021; Fabbri and Bignoni 2021), though the results are mixed. In Uganda, the presence of the mailo land institution is confounded by other factors, such as ethnicity and historical political institutions, necessitating an experimental approach to elucidate the impact of land tenure security on environmental behavior and economic preferences in this context.

Objectives

Given the pervasiveness of insecure land tenure institutions around the developing world, and the role of historical institutions in shaping preferences and behavior, it is important to understand how the design of PES programs may interact with historical land tenure structures. In this project, we design a willingness to accept experiment, and framed field experiment, across three regions of Uganda to answer the following questions:

1. What is the optimal design of an avoided deforestation PES program in Uganda?
2. How do land tenure institutions impact the design of an avoided PES program in Uganda?
3. How does the security of land tenure impact deforestation behavior and trust in Uganda?

Hypotheses

We begin with the specific hypotheses to be tested.

H1: What is the average willingness to accept a PES payment for avoided deforestation across our entire sample?

> H1A: The average WTA will be positive, and higher for households that have charcoal production than for those that depend upon other forest or land uses.

H2: Does this amount vary according to land tenure class or timing of payments?

> H2A: Households in areas of higher deforestation risk and with mailo tenure will require higher payments to participate in a PES program.

> H2B: Households will prefer quarterly payments over annual payments.

H3: Who should receive payments?

> H3A: (Tenant) households with mailo tenure will need to split payments between landowners and tenants.

> H3B: Households with freehold/leasehold tenure will prefer to receive payments directly

> H3C: Households with communal tenure will need to share payments with others (clan leaders? or other?)

H4: In the tree game, households with the mailo treatment will choose the highest extraction rates, followed by those with mailo treatment with the option to purchase a certificate, with the lowest extraction rate for those with the private treatment

> H4A: High extraction rates in the mailo treatment will be even higher in historically mailo regions.

H5: In the trust game, households with mailo treatment will exhibit lower levels of trust than those with the other two treatments.

Units of analysis and outcomes

Unit of analysis:

The unit of analysis in all cases will be the household, although WTA estimates will be averaged over subgroups in the sample.

Outcomes:

H1-H2B: The primary outcome for these hypotheses will be an indicator for whether or not the household accepts the theoretical monetary offer that they are given. From this estimation we can calculate WTA on average and for subgroups (see below). We will also be able to assess whether willingness to participate is greater for those offered quarterly versus annual treatments.

H3: The primary outcomes for these hypotheses are the responses to the questions on how households would prefer payments to be distributed. These vary according to stated tenure type.

H4: The outcome is the mean extraction rate over all rounds for which trees were harvestable in the mailo game.

H5: Here the outcome is the share of the endowment sent as player 1 and the share returned as player 2 in the trust game.

Basic methodology:

The experimental features of this study include a modified referendum question regarding willingness to accept a hypothetical PES payment, and a series of incentivized games, one focused on harvesting of trees and the other on trust. Non-incentivized measures of risk and time will also be collected, as well as information on basic household demographics and assets.

Design WTA referendum question:

The referendum question design follows standard practice: it begins with a brief description of the contract for tree conservation on one hectare of land and then presents a randomized price, to which the individual responds that they would accept or not accept the payment. There are two versions of this question: one for households identified as having access to communal forest and one for households with mailo or private forest access. Within each of these categories, there are contracts offering the option of one payment per year or dividing the same payment equally across four quarters. There are therefore two levels of randomization: the price and the timing. Households will only respond to one version of the timing.

Follow up questions asking if they would like to enroll more land, and whether or not they would accept a higher or lower price for the same piece of land (higher if they responded no the first time, lower if they responded yes) are meant for descriptive purposes and also to test respondent understanding of the contracts.

Design tree game:

Participants will be asked to make decisions about harvesting trees in an experimental "forest" over several periods. Participants are not told how many periods over which they will make decisions, and so may think of the task as an infinite, discrete choice game.

At the beginning of the game, a participant is endowed with 12 trees. In each period, the participant is asked to decide how many trees to harvest, for which they will earn a profit in real money. There is a revenue and cost function that determine profits in each period as follows:

$$\pi_{it} = ah_{it} - \frac{1}{2}bh_{it}^2$$

where h_{it} represents the number of trees harvested in each period *t* by participant *i*, and *a* and *b* have been calibrated according to pilot data on the marginal revenue and costs associated with producing charcoal. In addition, there is a forest regrowth constraint based on the stock of trees remaining. For every 5 trees remaining in the forest, 1 tree will regrow in the next period.

Participants will be randomized at the individual level, in equal proportions, into 1 of 3 groups:

- **Group 1**: Insecure property rights (mailo treatment). Participants experience a 20% probability of being kicked off the land in each round. To determine whether the participant is kicked off the land, the participant will draw a marble from a bag containing 2 red and 8 blue marbles. If they draw a red marble, the game ends and no more harvesting decisions are made. The participant keeps their accumulated earnings from each period up to that point.

- **Group 2**: Insecure property rights with option to secure. Participants experience a 20% probability of being kicked off the land in each round, as in Group 1. However, they may secure their property rights by purchasing a certificate of occupancy for a cost, which will be deducted from their earnings. The cost of the certificate has been calibrated from pilot data on the true cost of certificates relative to the average profit per tree harvested.

  Participants will be offered the option to buy the certificate at the beginning of each round. If they purchase a certificate of occupancy, they move to full property rights in which there is a zero probability of being kicked off the land. The game finishes until no trees remain or the periods expire. If they do not purchase a certificate, the game proceeds as in Group 1.

- **Group 3**: Full property rights. Participants make harvest decisions until no trees remain or the periods expire.

See Appendix 1 for the tree game instructions.

To compensate for the fact that, in expectation, total earnings will be systematically lower across groups, participants in Group 1 will receive an additional 2,000 UGX in their show-up fee and participants in Group 2 will receive an additional 1,000 UGX.

Design trust game:

The trust game follows the design of Berg et al. (*Games and Economic Behavior*, 10, pp. 122–142, 1995). Participants will be randomly paired with an unknown person who they are told is from somewhere else in Uganda. Each pair is made up of a Player 1 and a Player 2. To start, Player 1 receives 4,000 UGX. Player 1 then decides how much to give to Player 2. The amounts that Player 1 can give are: 4,000, 3,000, 2,000, 1,000, or nothing. Any amount that Player 1 decides to give to Player 2 will be tripled before it is given to Player 2. Next, Player 2 decides how much to return to Player 1. Player 2 can return any portion (including zero) of the amount they received back to Player 1.

Each participant will play the trust game twice: first as Player 1 and again as Player 2. We will follow the strategy method in which the participants state the amount they would return as Player 2 for every possible behavior from Player 1.

After Player 1 and Player 2 choices are elicited, we will randomly select one strategy (Player 1 or Player 2) to be implemented for real payment.

See Appendix 2 for the trust game instructions.

For robustness, we will also measure stated preferences for trust in the survey, using questions from the Afrobarometer survey:

1. Generally speaking, do you think that most people can be trusted or that you need to be very careful in dealing with people? (1. Most people can be trusted; 2. Need to be very careful)
2. I'd like to ask you how much you trust people from various groups. Could you tell me for each whether you trust people from this group completely, somewhat, not very much or not at all? (1. Do not trust at all; 2. Trust a little; 3. Trust somewhat; 4. Trust completely)
    a. Your relatives
    b. Other people you know
    c. Other Ugandans (i.e., not your relatives and not other people you know)

Sampling

The goal is to sample households with access to forest, in areas that have experienced significant deforestation in recent years. To establish this sample, we exploited the dataset described in Hansen et al. (2022). This dataset combines previous work by the authors quantifying land use type, forest gain, and forest loss, with forest cover metrics for 2019 and changes between 2000 and 2019. We selected regions of Uganda with the greatest percentage of land covered by the category of forest called "dense forest", and within these regions, we dropped districts with tiny amounts of detectable forest (less than 10%), and also island districts. We then selected districts with the highest historical deforestation and area of dense forest. The two districts per region that qualified under these criteria were Bududa, Kazo, Kiruhira, Luwero, Mpigi, and Namisindwa. We then replaced Mpigi with Mubende because most of the forest in Mpigi is located in protected areas.

Our final districts for analysis are: Bududa, Kazo, Kiruhira, Luwero, Mubende, and Namisindwa. Within these, we are targeting a sample of 560 households per region, for a total of 1,680 households. Because our goal is to interview households that have forest access, we are again using the forest data above to help identify these types of households. The Ugandan Bureau of Statistics has produced a layer of lat long points identifying village locations in 2019. Using this layer, we will draw a 3 km buffer around each village point. We will drop villages from the potential sample that have no identifiable forest cover within the buffer. From the remaining sample, we will draw 28 villages per region, with the intention of surveying 20 randomly selected households per village.

Respondents to the survey will be identified via a listing exercise with the local leader in their village. Ignosi Research will then visit these villages to hold a meeting with the local leaders and introduce the project. During this meeting, we will show the local leaders images of the forested area in their village on a map and ask them to identify all households with access to the identified forested land. This list of households will serve as the sample frame. Note that this method of identification has been successfully implemented in Uganda with previous studies on PES (Jayachandran et al. 2017).

Once we have constructed a full list of households with access to forest in the identified villages, we will randomly select households in each village. The randomization will be conducted by CIs Walker and Alix-Garcia via computer software. The survey company will then re-visit the villages with selected households to conduct the study. When the survey team arrives in a village to conduct the survey and experiment, they will first meet with the local leader and provide them with the list of households that have been sampled. They will then ask the local leader to help them locate the household head for interviewing. The household head will then be read the verbal consent script and choose whether to participate. The consent process will be conducted in private (i.e., the local leader will not be present).

Power calculations

WTA:

The sample size was determined to satisfy the requirements of a WTA experiment with 5-7 levels of payment. There are 3 regions with potentially 2 types of payment (annual and quarterly), which makes 6 arms. We calculated power using a dose-response function common in the health literature and also simulated the possible sample size using data from a similar WTA experiment in Mexico. The most conservative estimate of sample size was 280 per payment type per region.

Tree game:

Our empirical objective is to compare average harvest behavior under full vs. insecure property rights. The optimal harvest rate under full property rights is 2 trees per round. Assuming a standard deviation equal to the mean, with 0.80 power and alpha = 0.05, adjusted for a 3-arm design (alpha = 0.05 / 2 = 0.0025), we could detect at minimum a 25% difference in average harvest rates across groups with our sample size (N=560 in each arm).

Comparing only full rights with insecure rights (Group 1 v. Group 3), we can detect at minimum a 14.7% difference with this sample size.

Trust game:

Our empirical objective is to compare the impact of different property rights structures in the tree game on behavior in the trust game. We have calibrated power calculations using information on stated trust preferences from the Afrobarometer survey for Uganda and information on behavior in the trust game among Ugandan participants from Johnson and Mislin (Journal of Economic Psychology, 32, pp. 865-889, 2011). Matching the Afrobarometer survey with information on land tenure security suggests that insecure land tenure is associated with 22% lower trust in Uganda.

Assuming 0.80 power and alpha = 0.05, adjusted for a 3-arm design (alpha = 0.05 / 2 = 0.0025), we could detect at minimum a 22% reduction in the amount sent by Player 1 in the trust game across groups with our sample size (N=560 in each arm).

Comparing only full rights with limited rights (Group 1 v. Group 3), we can detect at minimum a 15% difference with this sample size.

Pre-specified analytical decisions:

WTA:

The estimation strategy to calculate median WTA is drawn from the environmental literature. We use the log-transformed price rather than levels. The probability of a yes response is:

$$\begin{aligned} \Pr(y_i) &= \Pr(B_i \geq WTA_i) \\ &= \Pr(lnB_i \geq X_i\beta + \varepsilon_i) \\ &= \Pr(\varepsilon_i \leq lnB_i - X_i\beta) \end{aligned}$$

Where y_i is equal to 1 if the response is yes, B_i is the random bid offer, and WTA_i represents the individual's unobservable willingness to accept a PES payment. X_i are covariates listed above, and ε_i are unobservables, possibly clustered at the village level. To estimate the parameters, we normalize by the standard deviation of by ε_i , which leads to

$$\begin{aligned} \Pr(yes) &= \Pr\left(\frac{\varepsilon}{\sigma} \leq \frac{1}{\sigma}\ln B - X\frac{\beta}{\sigma}\right) \\ &= \Pr\left(\varepsilon^* \leq \gamma \ln B + X\theta\right), \end{aligned}$$

where $\varepsilon_j^* \sim N(0,1)$, $\gamma = 1/\sigma$ and $\theta = -\beta\gamma$. Estimation by maximum likelihood recovers values γ and θ, which are used to recover elements of the distribution of willingness to accept. Specifically, since willingness to accept is log-normally distributed, the conditional percentiles of the distribution are

$$WTA_i^p = \exp(z^p\sigma + \beta X_i),$$

where z^p is the p^{th} percentile of the standard normal distribution. We will calculate the distribution of WTA by land tenure type and also by timing of the offer.

Tree game:

Our main dependent variable is the share harvested in each round:

$$\bar{h}_{it} = \frac{h_{it}}{S_{it}} \quad \forall S_{it} > 0$$

where h_{it} is the total trees harvested played by participant *i* in round *t* and S_{it} is the stock in each round. We will then compare mean harvest rates across the three treatment groups, first as a comparison of means, then in a regression framework, where we estimate the following equation:

$$\bar{h}_{it} = \alpha + \rho_t + \beta_1 Insecure_i + \beta_2 Certif_i + \gamma X_i + \varepsilon_{it}$$

$Insecure_i$ is an indicator for whether the participant was in Group 1 and $Certif_i$ is an indicator for whether the participant was in Group 2, and ρ_t is a fixed effect for the round. The reference group is thus participants with full property rights in Group 3. We will present results with and without individual controls, X_i.

We expect: $\beta_1 > 0$, $\beta_2 \geq 0$, and $\beta_1 > \beta_2$.

We will also examine heterogeneity by the type of land tenure the participant currently faces by exploiting whether they live on mailo land in real life. We will estimate the following equation:

$$\bar{h}_{it} = \alpha + \rho_t + \beta_1 Insecure_i x\ Mailo_i + \beta_2 Certif_i x\ Mailo_i + \beta_3 Insecure_i + \beta_4 Certif_i + \rho\ Mailo_i + \gamma X_i + \varepsilon_{it}$$

We expect: $\beta_1 > 0$. We are uncertain about the prediction for β_2.

Trust game:

Our main dependent variable of interest is the share of the endowment sent as Player 1. First, we will conduct a comparison of means across the three treatment groups. Then, we will estimate the following equation:

$$y_i = \alpha + \beta_1 Insecure_i + \beta_2 Full_i + \gamma X_i + \varepsilon_i$$

where y_i is the share of the endowment sent and $Full_i$ is the group with full property rights, such that the reference group are those who had the option to purchase the certificate. We expect: $\beta_1 < 0$, $\beta_2 \leq 0$, and $\beta_1 \leq \beta_2$.

We will also examine heterogeneity by the type of land tenure the participant currently faces by exploiting whether they live on mailo land in real life. We will estimate the following equation:

$$y_i = \alpha + \beta_1 Insecure_i x\ Mailo_i + \beta_2 Full_i x\ Mailo_i + \beta_3 Insecure_i + \beta_4 Full_i + \rho\ Mailo_i + \gamma X_i + \varepsilon_i$$

We expect: $\beta_1 < 0$, $\beta_2 \leq 0$, and $\beta_1 < \beta_2$.

For robustness, we will re-estimate these equations using the stated preferences for trust, measured in the survey, as an alternative measure of trust.

Lastly, we will we will re-estimate these equations using the share returned as Player 2 in the trust game as a measure of trustworthiness.

Control variables:

In the tree and trust games, we will first check for balance of covariates across the three groups to verify that the randomization was successful. We will run estimations both with and without controls.

In the WTP estimations, as well as the Tree and Trust specifications with controls, we will include the following controls: indicators for main sources of income being land related (charcoal, livestock, agriculture, etc.); wealth as measured by an asset index created from section B of the survey; household size and composition; sex of respondent; highest level of schooling in the household; risk and time preferences. We will also control for the area of land to which individuals have access as well as whether or not a household states that they have engaged in charcoal production or sale of trees for charcoal. We will also predict individual WTP based off of these estimations and examine heterogeneity across relevant targeting variables (land tenure type, sex of respondent, etc.).

Appendix 1: Tree game instructions

Now we are going to play a game that asks you to make decisions about harvesting trees. I would like for you to imagine that you that are responsible for managing a plot of trees, just as you do in real life. These 12 trees represent your forest.

[*ENUMERATOR: Give the participant their 12 trees; lay them out on the ground or table*]

You are responsible for managing this forest. You can decide to cut down some of the trees, and for each of the trees that you cut, you will earn real money, just as you do in real life.

We will play this game over several rounds. You can think of each round as a year or harvesting season. At the beginning of each round, you must decide how many trees to harvest. For each tree that you harvest, you will earn real money, which I will pay you in total at the end of this interview. This table represents how much you will earn for each tree you harvest.

[*ENUMERATOR: Give the participant the payout table and walk them through the payoffs*]

The profit that you earn from cutting down these trees is similar to the value of charcoal or timber that you would earn from cutting down real trees. For example, if you decide to cut down 2 trees, you will earn 1600/=. If you decide to cut down 5 trees, you will earn 2500/=. The profit you earn from cutting down these trees depends on what you can sell them for and what it costs you to cut them down (for example, paying others to help you, transporting them, or drying, burning, and packaging them). You can see from the table that the more trees you cut down, the more you will earn, but only up to a certain point. After the 5th tree, your profit starts to decline again because the costs of cutting down the trees is increasing faster than the amount you can sell them for.

In each round, you will decide how many trees to cut down. I will then remove these trees from the forest and calculate your earnings in that round. We will then see how many trees remain in the forest. At the end of each round, the forest can regrow. For every 5 trees remaining, 1 tree will grow. So, for example, if you leave all 12 trees in the forest, there will be 14 trees in the forest in the next round. Or if you leave 7 trees in the forest, there will be 8 trees in the next round. If you leave 4 trees in the forest, there will be 4 trees in the next round.

We will play the game until the rounds are finished or until there are no more trees left in the forest to harvest, whichever comes first.

Let's do some practice rounds to make sure you understand your choices.

[*ENUMERATOR: Go through 3 practice rounds and answer any questions*]

Okay, now we are going to play the game for real.

[*ENUMERATOR: Read the corresponding instructions for the treatment group to which the participant has been randomly assigned*]

TREATMENT GROUP 1

Before we proceed, let me clarify your rights to this land. Your access to this forest is not secure. There is a landlord who owns this land. The landlord has granted you the right to use this land, but in each round, there is a chance that you could be kicked off the land. If this happens, you no longer have the right to access this forest and the game is over. In each round, your chance of being kicked off the land is 2 in 10, or 20 percent. To help you understand these chances, consider this bag of marbles.

[*ENUMERATOR: demonstrate with the bag of marbles*]

As you can see, here I have 10 marbles. 8 are blue and 2 are red. The red marbles represent the chance that you are kicked off the land in each round. We will begin the game with Round 1, as we have been doing so far. At the beginning of Round 2, and for each round that follows, I will ask you to draw a marble from this bag. If it is blue, you can stay on the land and continue making your harvest decisions for that round. If it is red, you have been kicked off the land and the game is over. You will keep any money that you have earned up until you are kicked off the land.

Do you have any questions?

TREATMENT GROUP 2

Before we proceed, let me clarify your rights to this land. Your access to this forest is not secure. There is a landlord who owns this land. The landlord has granted you the right to use this land, but in each round, there is a chance that you could be kicked off the land. If this happens, you no longer have the right to access this forest and the game is over. In each round, your chance of being kicked off the land is 2 in 10, or 20 percent. To help you understand these chances, consider this bag of marbles.

[*ENUMERATOR: demonstrate with the bag of marbles*]

As you can see, here I have 10 marbles. 8 are blue and 2 are red. The red marbles represent the chance that you are kicked off the land in each round. We will begin the game with Round 1, as we have been doing so far. At the beginning of Round 2, and for each round that follows, I will ask you to draw a marble from this bag. If it is blue, you can stay on the land and continue making your harvest decisions for that round. If it is red, you have been kicked off the land and the game is over. You will keep the money that you earned up until you were kicked off the land.

However, there is a way to ensure that you are never kicked off the land. You have the option to purchase a certificate of occupancy. You can buy the certificate of occupancy now, or you can wait. You will have the option to buy the certificate of occupancy at the beginning of each round, before you make any decisions about cutting trees and before we draw a marble to decide whether you've been kicked off the land. Once you have the certificate, your access is secure. If you draw a red marble in future rounds, and you have purchased the certificate of occupancy, you will NOT be kicked off the land; you can continue playing the game until we reach the end or there are no more trees left.

The certificate costs 1200/=. If you decide to buy the certificate, I will deduct this amount from your earnings. If you buy the certificate now, I will deduct the 1200/= from your earnings in Round 1. If you buy the certificate in later rounds, I will deduct the 1200/= from your total accumulated earnings up to that point.

[*ENUMERATOR: Do a couple practice rounds to demonstrate how to purchase the certificate and how this affects total earnings*]

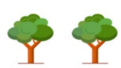
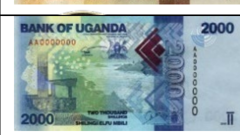
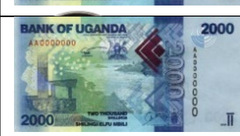
Do you have any questions?

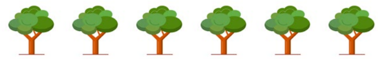
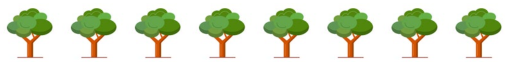
[*ENUMERATOR: before starting, ask if they would like to purchase a certificate. If not, then, at the beginning of each round, ask them again if they'd like to purchase a certificate before drawing a marble from the bag. If they do not have enough money to purchase the certificate, they cannot purchase the certificate until they've harvested enough earnings to pay for it.*]

TREATMENT GROUP 3

Proceed with the game.

Earnings

#	Trees	USh	You receive:
1		900/=	
2		1600/=	
3		2100/=	
4		2400/=	
5		2500/=	

6		2400/=	
7		2100/=	
8		1600/=	
9		900/=	
10		0/=	

Appendix 2: Trust game instructions

This game is played in pairs. Each pair is made up of a Player 1 and a Player 2. To start, Player 1 receives 4,000/=. This is real money that Player 1 can keep for themselves, or they can decide to give some of it to Player 2. The amounts that Player 1 can give are: 4,000/= (all of it), 3,000/=, 2,000/=, 1,000/=, or nothing. Any amount that Player 1 decides to give to Player 2 will be tripled before it is given to Player 2.

Next, Player 2 decides how much to return to Player 1. Player 2 can return any portion of the amount they received back to Player 1. They can also decide to return nothing.

After Player 2 makes their decision, the game is over. At the end of the game, each player goes home with real money. Player 1 will receive the amount they kept from the original 4,000/=, plus anything returned to them by Player 2. Player 2 will receive the tripled amount of what Player 1 gave them, minus the amount they sent back to Player 1.

Today, you will play this game twice: once as a Player 1, and once as a Player 2. Each time you play, you will play with a random person from our study, meaning that your partner is from somewhere in Uganda. They could be from your village or they could be from a different district. But you will never know the identity of this person and they will never know who you are.

Before we play for real, let's go through some examples to make sure you understand your choices: [*ENUMERATOR: SHOW EXAMPLES WITH REAL MONEY*]

1. Imagine that Player 1 gives 4,000/= to Player 2. I will triple this amount, so that Player 2 gets 12,000/= (3 times 4,000 equals 12,000/=). This means that Player 1 has nothing and Player 2 has 12,000. Now, Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return 4,000/= to Player 1. At the end of the game Player 1 will go home with 4,000/= and Player 2 will go home with 8,000/=.

2. Let’s try another example. Imagine that Player 1 gives 2,000/= to Player 2. I will triple this amount, so that Player 2 gets 6,000/= (3 times 2,000 equals 6,000/=). This means that Player 1 has 2,000 and Player 2 has 6,000. Now, Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return 1,000/= to Player 1. At the end of the game Player 1 will go home with 3,000/= and Player 2 will go home with 5,000/=.

3. Let’s try another example. Imagine that Player 1 gives 3,000/= to Player 2. I will triple this amount, so that Player 2 gets 9,000/= (3 times 3,000 equals 9,000/=). This means that Player 1 has 1,000 and Player 2 has 9,000. Now, Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return 4,000/= to Player 1. At the end of the game Player 1 will go home with 5,000/= and Player 2 will go home with 5,000/=.

4. Let’s try another example. Imagine that Player 1 gives 1,000/= to Player 2. I will triple this amount, so that Player 2 gets 3,000/= (3 times 1,000 equals 3,000/=). This means that Player 1 has 3,000 and Player 2 has 3,000. Now, Player 2 has to decide whether they wish to give anything back to Player 1, and if so, how much. Suppose Player 2 decides to return 1,000/= to Player 1. At the end of the game Player 1 will go home with 4,000/= and Player 2 will go home with 2,000/=.

5. Now let’s try another example. Imagine that Player 1 gives nothing to Player 2. There is nothing for me to triple. Player 2 has nothing to give back and the game ends here. Player 1 goes home with 4,000/=. Player 2 goes home with nothing from this round. But, remember that because everyone plays this game twice – once as Player 1 and once as Player 2 – Player 2 goes home with whatever she earned as Player 1 in the previous round.

You may have noticed from the examples above that when Player 1 gives more to Player 2, the total amount that can be shared between the two players is larger. However, it is entirely up to Player 2 to decide how much they want give back to Player 1. Player 1 could end up with more than the initial 4,000/= or less than 4,000/= as a result.

Now let's work through some examples together:

1. Imagine that Player 1 gives 3,000/= to Player 2. So, Player 2 gets 9,000/= (3 times 3,000 equals 9,000). At this point, Player 1 has 1,000 and Player 2 has 9,000. Suppose Player 2 decides to return 3,000 to Player 1.

   At the end of the game Player 1 will have how much?

   [ENUMERATOR: Player 1 gave 3,000, so has 1,000 to keep; Player 2 returns 3,000, so **1,000 + 3,000 = 4,000**]

   And Player 2 will have how much?

   [ENUMERATOR: Player 1 gave 3,000 x 3 = 9,000, then Player 2 returned 3,000, so: **9,000 – 3,000 = 6,000**]

2. Imagine that Player 1 gives 1,000/= to Player 2. So Player 2 gets 3,000/=. Then, suppose that Player 2 decides to give 2,000 back to Player 1.

   At the end of the game Player 1 will have how much?

   [ENUMERATOR: Player 1 gave 1,000, so has 3,000 to keep; Player 2 returns 1,000, so: **3,000 + 1,000 = 4,000**]

   And Player 2 will have how much?

   ENUMERATOR: Player 1 gave 1,000 x 3 = 3,000, then Player 2 returned 1,000, so Player 2 has: **3,000 – 1,000 = 2,000**]

Do you have any questions?
[ENUMERATOR: answer any questions and verify that they understand the game; use more examples if they need more practice]

Remember that you will play the game twice: first as Player 1 and then as Player 2. So, at the end of the interview, you will receive 2 sums of money from this game: (1) As Player 1, you will receive the amount that you keep from your initial 4,000/=, plus whatever Player 2 sends back to you; and (2) As Player 2, you will receive the amount you decide to keep from the tripled amount that Player 1 gave you. We will pay you your earnings from your decisions as either Player 1 or Player 2 in real cash at the end of this interview. We will flip a virtual coin to decide which one to pay you, so you will have a 1 in 2 chance to receive your earnings from your decisions as Player 1, or Player 2.

Player 1 Let's begin with Player 1. Here is your 4,000/=. I am also giving you 2 envelopes. In one envelope, please put the amount of money you want to give to Player 2. You can give Player 2 nothing, 1,000/=, 2,000/=, 3,000/=, or 4,000/=. I will triple this amount and give it to Player 2. While Player 2 is under no obligation to give anything back, we will give you back whatever they decide to return. In the other envelope, please put the amount of money you want to keep for yourself. We will give you the amount you kept for yourself, plus whatever Player 2 returns to you, at the end of this interview.

[*Now the player hands back both envelopes*. *Envelopes should be marked with respondent ID and whether it is the KEEP or SENT amount. Be sure to keep track of the envelopes separately*]

- Before we move forward, I would like to ask you how much do you **believe** Player 2 will return to you? [*Enter amount*]

Player 2: Now you are playing as Player 2. This amount represents the 4,000/= that Player 1 started with. [*Put the cash in front of the respondent.]*] Before we tell you how much Player 1 sent to you, we will ask you for your plan. What would you do in each situation if Player 1 sent 1,000/=, 2,000/=, 3,000/=, or 4,000/=? At the end of this interview, I will tell you how much Player 1 ACTUALLY gave you and you will have to return the amount that you said in your plan.

1. If Player 1 decided to send 4,000/= and it was tripled, you would receive 12,000/=. How much would you return to Player 1? Remember that you can choose any amount, including zero, to return to Player 1. [*Enter the amount*]
2. If Player 1 decided to send 3,000/=, and it was tripled, you would receive 9,000/=. How much would you return to Player 1? Remember that you can choose any amount, including zero, to return to Player 1. [*Enter the amount*]
3. If Player 1 decided to send 2,000/=, and it was tripled, you would receive 6,000/=. How much would you return to Player 1? Remember that you can choose any amount, including zero, to return to Player 1. [*Enter the amount*]
4. If Player 1 decided to send 1,000/=, and it was tripled, you would receive 3,000/=. How much would you return to Player 1? Remember that you can choose any amount, including zero, to return to Player 1. [*Enter the amount*]

[*ENUMERATOR: finish conducting the survey and pay the respondent for all experiments at the end of the survey*]

Player 1 outcomes

As Player 1, you sent ______. Therefore, Player 2 received _____ (tripled quantity). Player 2 decided to return ______. So, you are left with ______.

Player 2 outcomes

Player 1 sent ______. Therefore, you received _____ (tripled quantity). As you said in your plan, you will return _______ to Player 1. So, you are left with ______.