**“Money Growing on Trees” Instructor How-To:**

Before class:

* Prep spreadsheet:
  + delete data if necessary
  + add or delete contract periods by pasting copies of worksheets or deleting worksheets (if so, adjust “Tot Earn” column and “summaries” worksheet)
    - you can leave extraneous contract periods in, but if so the Tot Earn column will be wrong.
* Ensure that Excel on the computer that you will use to project the spreadsheet during the session is set to automatically perform calculations.[[1]](#footnote-1)
* If desired, prep PowerPoint with basic info about treatments; though if you use a ppt it will require you to switch the projector back and forth between the spreadsheet and the ppt; alternately, you can just write info on the board

Bring to class:

* If you plan to pay: money (ones, theoretically up to $10 per payee)
* Playing cards 1-10 (i.e., face cards taken out), plus as many jokers as possible (5-20% of cards should be jokers); alternatively, you can use face cards in place of jokers
* Printed instructions
* If desired, REDD+ handout

What to do in class:

* Bring up spreadsheet (and, if desired, PowerPoint)
* Hand out instructions and tell them to read
* Hand out playing cards randomly; they’re allowed to look at them and show them to others once they have them, but can’t look at cards to choose their desired one
* Tell players to record their card numbers on the sheet
* Background:
  + Climate change is a problem
  + We can fight it by reducing sources or increasing sinks
  + Some places are regulated or are self-regulating (voluntarily reducing emissions), so need to reduce emissions
    - Can do it directly – cut our own emissions
    - Or indirectly – pay someone else to reduce a source or increase a sink
      * This is what an offset is
  + Deforestation is a significant source of GHG emissions and afforestation and forest management has a large potential as a GHG sink
  + UN’s climate initiative has been working on REDD+ as a way to generate offsets
    - Reduce deforestation as compared to some baseline; here, the baseline is an expectation that it will be cut down
  + It’s a PES system: since the preserved forest is providing ecosystem services that are a global public good, PES system monetizes those benefits, i.e. internalized the externality to incentivize optimal conservation
* Basic information:
  + You’re rural households
  + You do subsistence farming and exploit the local forest to support your family
  + Your forest exploitation can hurt the forest, which is bad because the forest provides global public goods, including carbon sequestration
  + Let’s see how a payment for environmental services scheme can change your choices about whether to harvest from the forest
  + Your earnings in a contract period come from:
    - Farming Income – subsistence (usually $70)
    - Harvest Value – if you harvest from the forest, you get a value of $10\*your playing card
    - REDD+ Payment – if you are in a REDD+ contract, you get a payment (usually $50)
    - (Policing or Fines) – in treatments where there can be fraud (cheating), you may lose money to police your community or as fines for cheating
* CP1: baseline
  + Write on board: $70 payment, no fraud
  + Everyone write down REDD+ decision
  + Go around room and call out ID, harvest value, and REDD+ decision, recording in decisions spreadsheet; tell them to record their ID number as we go around.
    - Record quickly, and do it in an order that you can easily replicate each time (e.g., go across one row then the next, etc.)
    - Record J for jokers and face cards
  + Show earnings; show summary page
  + Key things to discuss after round is complete:
    - Marginal abatement cost is opportunity cost: foregone forest exploitation
    - Cost effective conservation: minimize costs of reaching target
    - Regulator may not know everyone’s costs, so voluntary system with demand revelation is essential
    - Rationality and voluntary conservation
    - Additionality: joker parcels were non-additional contracts
* CP2: baseline + fraud
  + Write on board: fraud possible. 25% chance of auditing. If caught, lose: REDD+ payment, harvest earnings, and $70 fine
  + Everyone write down both REDD+ decision and harvest decision
  + Go around room and call out both decisions
  + Type anywhere in spreadsheet to determine who will be audited
  + Then copy and paste audit column to make it permanent
  + Call out ID numbers that committed fraud and are audited in case they can’t see
  + Show earnings; show summary page
  + Key things to discuss:
    - Verifiability
    - Rational crime theories
* CP3: harvest uncertainty
  + Write on board: $70 payment, no fraud; harvest value has 50% chance of being 20x card and 50% chance of 0
  + Everyone write down REDD+ decision
  + Go around room and call out REDD+ decision, recording in decisions spreadsheet
  + Type anywhere in spreadsheet to determine who gets shocked
  + Then copy and paste shock column to make it permanent
  + Call out ID numbers that got shock in case they can’t see
  + Show earnings; show summary page
  + Key things to discuss:
    - Decide based just on expected value? Did anyone change their decision versus the baseline round?
* CP4: auction
  + Write on board: auction! Write down dollar bid. Lowest 50% accepted and receive REDD+ payment of lowest not-accepted bid
    - Draw a picture: a vertical ranking, marking the highest bid, the lowest bid, the median line
    - All bids below the median line are accepted
    - The bid just above the median is the lowest bid not accepted and this bid determine the REDD+ payment for everyone in the auction
  + Everyone write down bid
  + Go around room and call out bids, recording in decisions spreadsheet
  + Go to the summary page to show the median bid (everyone who bid BELOW this wins) and the resulting REDD+ payment
  + Show earnings; show summary page
  + Key things to discuss:
    - If we know the distribution of opportunity costs, we can structure a flat payment and an auction to both conserve the same amount of land and both will be cost effective
    - But if don’t know the distribution of opportunity costs, the auction should reveal those values and thus get desired conservation target
    - Auction theory: second price auction is incentive compatible (if your bid determines both whether you win and what you pay, you shade your bid down, so here it just determines whether you win)
* CP5: community
  + Write on board: community
    - 1. Decide as community whether to be in REDD+ contract & how to divide up payments if so (5 minutes to talk)
  + Note participation as a community is all or nothing
  + Defining communities
    - It’s easiest to just group people in order of where they’re sitting, but that means that people may be grouped with people they know, which reduces the fun a bit
    - Can instead add a rand() row and sort in order of that and assign groups based on that, and then re-sort; or you could count people off into groups (count 1-2-3… etc. and then tell all the 1’s to get together, all the 2’s, etc.)
  + Once communities are defined, people need to get physically with their communities. You also need to record who’s in which community; it’s also easiest if you then sort the spreadsheet by “Comm #” (column C) so that you can easily enter the group’s decision all at once
  + Give them 5 minutes to make REDD+ contract and payment allocation decision
  + Go around groups publicly and ask whether chose REDD+ contract and how divided up payments if so, recording decisions
  + Show earnings; show summary page
  + Key things to discuss:
    - This is more realistic; in many cases, individual contracts are not feasible
    - Community governance literature, see Ostrom and many others, shows that sometimes it works well and sometimes not! Why, do you think?
    - Equity and power within community
* CP6: community + fraud – this is the most complicated treatment, and takes the longest to run; you should definitely run CP5 before you run this so they get the hang of working with their groups
  + Write on board: community + fraud!
    - 1. Decide as community whether to be in REDD+ contract & how to divide up payments, including considering cases of fraud (3 minutes to talk)
    - 2. If in REDD+ decide as a community whether to police yourselves
      * If police, fraud is deterred
    - 3. If in a REDD+ contract and do not police, then individuals decide whether to harvest (record privately on sheet and then fold sheet to hide)
    - 4. Government audits each REDD+ contracts that don’t police themselves with probability 10% times number of people who commit fraud – if find fraud, REDD+ contract invalidated and whole community is fined
  + Note participation in REDD+ is for everyone or no-one in a community, but the fraud decision is individual
    - If your groups are going to be particularly large or small, you might want to change that 10% value to be smaller or larger respectively. You can do this in the “params” worksheet; it’s the parameter “community per-fraudster audit probability increment”
  + Use same communities as CP5, or if didn’t do that treatment, just group the same way we suggest there
    - If you have more than 10 communities, you’ll need to go to the “params” worksheet and add higher “Comm #” values to the block there
  + Give them 5 minutes to make REDD+ contract and payment allocation decision, and, if REDD+, whether to police
  + For any REDD+ / no policing communities:
    - All group members walk away from their groups (1 minute or less) to write fraud decision and fold or hide paper when return to hide decision – you can provide paper slips for this, or you can have them do it on their recording sheets
  + Go around groups publicly and ask whether chose REDD+ contract and how divided up payments if so and whether decided to police, recording decisions (including division of REDD+ payments if not uniform)
    - If they did decide to police, open all decision papers and see if there was fraud; record it if so
  + Randomly determine which REDD+ non-self-policed contracts are to be audited by typing somewhere in sheet to make the random numbers regenerate, then copy and paste-special (values only) the “Audit?” column to make it permanent
    - For any that were audited, open all decision papers and see if there was fraud; record it if so
  + Show earnings; show summary page
  + Key things to discuss:
    - Community enforcement; motives for and against enforcing in your neighborhood
* Pick people for payment
  + Go to summary page
  + Type anywhere in sheet to recalculate the random numbers that determine who will be paid; copy and paste-special (values only) to make permanent
    - If you want more than two people, you can copy and paste the cells we have provided as many times as you like
  + Look at the “Dollars” column for those people to see their earnings
* Discuss! Our paper that accompanies this game provides discussion questions you can use for in-class and online discussions or written assignments.

1. On a PC:

   2003: Tools > Options > Calculation > Calculation > Automatic.

   2007: Office button > Excel options > Formulas > Workbook Calculation > Automatic.

   2010 and 2013: File > Options > Formulas > Workbook Calculation > Automatic.

   On a Mac:

   2008: Excel Preferences > Calculation > Automatically. [↑](#footnote-ref-1)