Risky Business: Using Games to Understand Farmer Decisions in Sri Lanka

Lesson Plan

1. Prep game materials (see below)
2. Conduct pre-assessment with the students
3. Share game background and instructions
4. Play practice round to ensure everyone understands game rules
5. Play game a few times
    a. Depending on learning objectives and time considerations, can just play one version
6. Conduct debrief with students
7. Conduct post-assessment with the students
8. Follow up with Thushara (Tgunda@gmail.com) about how the process went.

Prep game materials

1. Decide on wheel of rain method
    a. Computer option: https://illuminations.nctm.org/adjustablespinner/
    b. Casino Wheel: 10-slot wheel available on Amazon
2. Set-up forecasts
    a. If doing a casino wheel, print and cut forecasts from forecastwheels.pdf. Will also need tape to attach the forecasts to the wheel → you could laminate the forecasts if you want to reduce tears.
3. Print farm land sheet (one per student)
4. Print yield return sheet (one per student)
5. Print and cut crop cards (need 3 of each crop per student)
6. Purchase poker chips (at least 200 for group of 8 students)
7. Decide on winner's "prize" (I typically just hand out cookies or brownies)

Pre-Assessment

See separate document.

Background (to be shared with students)

How many of you have ever made a friendly wager? Perhaps you bet on the recent ___ [enter a culturally-relevant event; e.g., Super bowl or March Madness in the United States]. Now, how many of you have made a bet that determined whether or not your family could eat?

While such large decisions are not the norm for us, they are for many farmers in Sri Lanka, who have to decide between planting rice or other food crops (OFCs).

- I want this side of the room to imagine you are planting rice; rice is the staple food in your diet so your crop will feed your family. But growing rice takes a lot of water and you are never quite sure how much it will rain this season. But if the rains do come, you can sell any excess crop you have to the government at a guaranteed price.
- This side of the room: you are planting other food crops, like onions, which don't need as much water to grow. Also, you don't need that many onions so you can sell most of your crop in the market and purchase rice and other foods to feed your family. But you are never quite sure how much you will make per pound of onions because your return depends on how many other farmers also planted the same crop.

Which bet would you make? Let's find out!

Instructions (to be shared with students)

Note to facilitators: Each farmer should be given: *1 farm land sheet of 3 fields, 5 poker chips, 3 sets of 3 crop cards, 1 yield return sheet*

Plots: You should each have three plots of farm land and 5 poker chips in front of you [point to the farm land sheet each has in front of them]. Let us know if you don't. Each land plot represents 0.5 acres. You will individually choose what to plant for each of the three plots by placing one of the crop cards [point to crop cards in front of them]. If you want, you can plant nothing by placing no card on your plot for that season. You can plant the same crop on all 3 plots, or you can plant up to three different types of crop, or anything in between.

Crop cards: Now, look at these crop cards. In addition to rice and onions, you only also have the option for planting soybeans, for which some local business are offering futures contracts (where they promise to buy the farmer's soybean crop at a set price). The cards also show each crop's cost per plot per season. The input and labor cost of growing onions is much greater, up to five times the cost of growing rice and soybean. It costs 1 chip to plant rice in one field, 2 chips to plant soybean, and 5 chips to plant onions. To make that clear, there is one dot on the rice card, 2 dots on the soybean card, and 5 dots on the onion card. To plant a crop, put its corresponding card on top of the plot of land you want to plant it in.

Money: Costs to plant the crops and returns from selling them are measured in poker chips [point to poker chips and point to the number of poker chips indicated on each crop card]. You will receive a set amount of working capital for your cultivation decisions. To begin, you will receive 5 poker chips. At the end of this game, the farmer with the most poker chips will receive a "cash prize." At the beginning of each season you need to pay for the crops you decide to plant. If you do not have enough poker chips, then plant fewer or different crops.

Yield return sheet: The return sheet in front of you shows the different crop yields under different weather conditions. The water requirements for soybean are comparable to those of rice but soybean is more tolerant of drought; in a drier climate, however, onions do much better. Note that while the return for rice and soybean are fixed, the return for onions is a range of values; the specific return is dependent on how many of your fellow farmers also plant the same crop. For every additional field of onions planted, the return is reduced by one poker chip. For example, if you plant onion on 1 field and 3 other fields are also planted with onion, and the weather is dry that season, the maximum return of 12 poker chips would be reduced by 3 so each of the farmers would only receive 9 poker chips for each plot of onion.

Weather: As you can see on the return sheet, the number of poker chips you can earn at the end of a season depends on the weather. There are 3 main weather possibilities: dry – less rain than normal, normal, and wet – more rain than normal. Most seasons there will also be a small probability of drought or floods as well. Each of these weather possibilities is color coded to match the weather wheel and the yield return sheet: dry is orange, normal is yellow, and wet is green while flood is blue and drought is red. Some crops do better with high levels of rain, and some do better with less rain – the yield return sheet shows the relationship between the crops and weather. Game play is led by [INSERT NAME OF PERSON LEADING and point to them]. [INSERT NAME] will spin the Wheel of Rain [point at wheel] and it will spin many times like this [actually spin the wheel] and randomly land on a color. When more of a color is on the wheel, there is a higher chance it will land on that color. If the forecast states there is a 70% chance of wet weather (more rain than normal), then 7 of the 10 slots on the wheel will be colored green. When the wheel spins, the color it lands on determines the weather for that season. Let's spin the wheel a few times and see where it lands.

Now we will go through **rules of the game**:

1. Each round of the game represents one season.
2. The facilitator picks a random forecast card and reads it. It will state that the government forecast for the season ranges will be 0-100% chance of it being dry, normal, or wet. An individual card could state, for example, that the season has a 0% chance of it being dry, 30% chance of it being normal, and 70% chance of it being wet. Some seasons also have a chance of extreme weather such as a flood or drought. [Draw another card and talk through what that card means. Do this a couple times.]
3. You pay the bank the costs on the cards that you choose to plant for that season.
4. The facilitator spins the Wheel of Rain, which has been configured to accurately represent the forecast. The Wheel lands on a particular slot, which will dictate the amount of rain in the season. [Do this.]

5. The amount of rain indicated by the wheel will determine yields and profits. Your return sheet indicates the profit for each weather possibility. The facilitator pays you the appropriate amount of profit in poker chips.
6. Another round starts. We will play multiple rounds. [Don't tell the students how many rounds are being played to avoid "end-game" effects]
7. The goal of the game is to accumulate as many poker chips as possible.

Directions for facilitators:

1. Bring together a maximum of 8 farmers or "farmer groups" in a room for a session.
2. Pass out all game materials:
    a. Farm land with 3 plots
    b. 5 poker chips
    c. Crop cards (3 of each crop)
    d. Yield return sheet
3. Read out game instructions ***Facilitator 1: Weatherman***
4. (Have group explain game back to you if needed)
5. Play a practice game.
    a. Show weather wheel for season's forecast
    b. What are you going to plant in each of your plots?
    c. Invest some money into preparing your plots
    d. Banker goes and around and collects the cost ***Facilitator 2: Banker***
    e. Spin wheel
    f. Tally how many onions were planted (with quick show of hands) to determine return for onions
    g. Banker goes around and returns profits ***F2* *F1 assists***
    h. Repeat steps a-f with changing forecast wheel a few more times as needed
6. Answer questions
7. Now we will play Version One, where you are **not allowed to** discuss your planting decisions with your neighbors
    a. Repeat a-g under Step 5
8. After 6 rounds, sum up farmers' profits and pay out winner
9. Now we will play Version Two, where you are **allowed to** discuss your planting decisions with your neighbors
    a. Repeat a-g under Step 5
10. After 6 rounds, sum up farmers' profits and pay out winner
11. Give non-winning farmers the participation prize (which is the same as the winner prizes)

Debrief with students (post-game)

This game was designed by a team of diverse researchers with backgrounds from physical hydrology to social psychology and behavioral economics. Because we are looking at a combination of physical factors (like weather) and social factors (like market conditions), we need insights from various disciplines beyond just engineering to understand how this system functions as a whole. The interactivity of the game enabled the researchers to understand how the farmers balance concurrent uncertainty related to both the weather and market. In January 2016, the researchers played the game with 49 farmers in one of the villages in Sri Lanka. In addition to capturing their planting decisions, the researchers spoke to the farmers about their strategies after each game.

Before we share the farmers' insights – let's discuss how you all approached the game. What were your strategies? What were the challenges? [gather student responses]

Farmers in Sri Lanka shared that they played the game as if it were real life. Farmers expressed that the game was easy to understand and, generally speaking, they opted to plant rice when the probability of a wet season was high. Most of the farmers also expressed that the weather forecast was a more relevant factor governing their crop selection decisions than market conditions; some said that having more specific information about market conditions would have helped inform their decision-making. Many of the farmers shared afterwards that they enjoyed playing the game and approached it as if the game was emulating reality and they were making decisions about crops on their own farm.

Did you enjoy playing the game? [gather student responses]

We believe that part of the reason the game was received well by the farmers was because the game design closely reflected the farmers' realities. For example, the costs and returns of the crops were derived from Agricultural Statistics books in the country (each chip ~ 30,000 Sri Lankan Rupees).

What do you think others could learn from this exercise? [gather student responses]

Conduct post-assessment

See separate document.