Seeds of Learning: Uncertainty and Technology Adoption in an Ecosystem-Based Adaptation Game

Babatunde Abidoye¹, Sahan T. M. Dissanayake², and Sarah A. Jacobson³

a: United Nations Development Programme, b: Portland State University, c: Williams College

INTRODUCTION

We introduce a detailed interactive game for use in classrooms and trainings to familiarize participants with ideas related to ecosystem-based adaptation to climate change, technology adoption under uncertainty, and small-scale agriculture in developing countries.

The game is fun and immersive! It takes 50 mins to 2 hours to complete, and works best with 10–60 participants. No background knowledge is required, but different groups (from undergrads to grad students to policymakers) will get different things from the exercise.

THE GAME

In the game, participants roleplay this scenario:

- You are a subsistence farmer in a low-income country
- Weather is changing → erosion is increasing
- The government wants to promote ecosystem-based adaptation (EBA)
- But many EBA practices are experimental or have only been tested in other climates: we don’t know how they’ll work here!
- In each of a series of contract periods, you’ll decide whether to adopt a contract to take up different EBA practices, with different circumstances.

Participants make their decision in each round and see the outcomes – their earnings, everyone else’s earnings, and ecosystem service provision. We suggest you pay a few participants based on their earnings!

ECOSYSTEM-BASED ADAPTATION

The climate is changing, exposing communities worldwide to changing conditions that put lives and livelihoods at risk. People and communities reduce risk through adaptation: costly actions that reduce damages. In some cases, hard or grey adaptation measures like revetments and sea walls may provide protection from flooding; Adaptation can also happen through policies and social initiatives. But this game focuses on ecosystem-based adaptation: use of natural systems to reduce impacts of a changing world.

In the context of agriculture, ecosystem-based adaptation often fights erosion as weather patterns become more extreme. Examples include riparian buffer strips (Figure 1), low-till or no-till farming (Figure 3), and agroforestry (Figure 5). These techniques can provide benefits to society through ecosystem services, but farmers are often uncertain about how they will affect their livelihoods.

THE TREATMENTS AND THEIR LEARNING OBJECTIVES

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Description</th>
<th>Learning Objectives</th>
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<tbody>
<tr>
<td>1. Baseline</td>
<td>No Government (No EBA)</td>
<td>Impacts of climate change: ecosystem-based adaptation, calculation agriculture is developing countries, erosion and water quality; provision of local public goods for ecosystem services programs, conservation and pollution reduction; ecosystem-based adaptation (EBA) takes longer to show during play, ideas about leading discussions and for participants, a list of suggested readings, slides to classrooms and trainings to familiarize participants with ecosystems.</td>
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In each treatment, EBA adoption has an explicit adoption cost to the farmer, also affects the farmer’s own yield, provides ecosystem benefits to all participants by boosting their yields (through water quality), and may come with a government payment. In the first three treatments, the impact on the farmer’s own yield is a simple 10% reduction. But this impact becomes more complex in the treatments that follow. In Treatment 4, the own-yield impact is uncertain: it is equally likely to be -30% or +10%.

In Treatments 5 and 6, there are both systemic uncertainty (how well this technique works in this area for all farmers: in Figure 4, whether your area is High Type or Low Type) and idiosyncratic uncertainty (how well your particular field is suited to it; in Figure 4, whether you are Farmer 1, 2, or 3). Therefore, it is additionally socially beneficial for some people to adopt the technique, especially early, because that lets others learn what impact they are likely to see. Thus, a pilot bonus may be helpful to encourage early adoption.

SUMMARY: PLEASE PLAY OUR GAME IT!

- Is detailed and context-rich
- Conveys concepts about payment for ecosystem services, costs, efficient and cost-effective land conservation, and climate change adaptation, especially ecosystem-based adaptation
- Focuses on uncertainty and learning spillovers in adoption of a new technology

We make it easy for you to play the game and tune it to your interests, and fun for your participants!

Figure 1: A Riparian Buffer Strip
(Photo: https://www.mnw.co.nz/news/dry-trails-turn-the-corner)

Figure 2: Excel Sheet for Recording Decisions (cells for recording decisions are yellow; all calculations are automated)

Figure 3: No-Till Maize
(Photo: https://www.fao.org/docrep/008/a01000e/a0100e07.htm)

Figure 4: Correlated Uncertainty in Yield Impact for Treatments 5 and 6

Figure 5: Agroforestry
(Photo: https://www.green-tistle.com/advantages-and-disadvantages-of-agroforestry/)

WE WELCOME COMMENTS ABOUT THE GAME!
Abidoye: babatunde@babidoye.com
Dissanayake: sdissan2@gmail.com
Jacobson: sarah.a.jacobson@williams.edu

Figure 5: Agroforestry
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