Plants v. Profits: Learning about Soil Health through an Innovative Board Game

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Introduction

Few Americans understand the implications of soil health in the long-term sustainability of our food (Bagstad et al., 2016). In Fall 2023, a team at Illinois State University set out to create a board game to help students understand the role of soil health in a sustainable food supply. Essential components of the game included an understanding of tilling practices, crop rotation, and the role cover crops can play in maintaining soil health. These three components incorporate NRCS principles for managing soil health: minimizing disturbance, maximizing living roots, maximizing soil cover, and maximizing diversity (USDA, n.d.). *Plants v. Profits* was designed to teach the value of these practices in a short play time and to be accessible to young students. The original target was for third graders to be able to play in 30 minutes. Although game complexity necessitated increases in both recommended time and age (sixth graders can play in 40 minutes), we have seen great evidence of learning for players in third grade and up.

Methodology

The board game began with a simple concept: letting players grow produce in a garden and then sell that produce for profit. By focusing on profit, we believed the game would feel similar to games like Life and Monopoly and that competition might feel natural. However, we sought to cultivate both competition between teams and cooperation within teams to maximize learner engagement. We also anticipated that the focus on profit would lead players to ignore soil health in the first year but allow them to see the value of sustainable soil practices over time.

We wanted the game to be based on real-world data: accurate growing seasons, appropriate yield, and suitable seed and produce prices. We were able to gather the necessary data from a variety of sources, most notably Johnny's Select Seeds (seed and yield data) and the USDA National Agricultural Statistics Service (wholesale to retail pricing). We were unable to find reputable data sources for harvest costs, so these costs were generated with an effort-comparison model in which the labor to harvest each crop over the season was compared with the known labor costs of harvesting heirloom tomatoes. Harvest costs and the impacts of different soil health practices were verified as realistic by multiple university agronomists and other experts in the field. All data was based on transplanted cash crops which would thrive in the USDA Plant Hardiness Zones 6a and 6b (USDA, 2023), spanning the NC-AAAE region from Maine to Nebraska.

The game changed between conceptualization and the first play test. For example, we changed crops based on which were represented across our data sources. We also refined the included crops based on the crops' relative profit power (yield times market price, divided by the sum of the seed and harvest cost). The final game includes eight profitable crops, five cover crops, and two crops that would lose money in a garden scenario (absent mechanical harvesting).

The game also changed between play tests. Over the course of more than 20 tests, the Planning Sheet and Profit Sheet saw multiple iterations, and the game was simplified to use "sad soil tokens" and eliminate the chance element of weather. Players collect sad soil tokens as a tangible representation of each soil health component: fallow land, tilling, and a lack of crop rotation all contribute to yield losses over time. The final game instructions include 10 steps with a play time of approximately 60 minutes for first-time players and 40 minutes for subsequent games.

Results to Date

Each play test allowed us to see the gameplay experience of different audiences: third grade through adults, players with and without an agricultural background, and in formal and informal settings such as agriculture classes, 4-H clubs, and library programs. When possible, we collected the players' game materials and recorded their results, including the ending profit and soil health as well as whether Planning or Profit Sheets showed evidence that they had achieved the game's soil health learning goals.

Play test data shows that the majority of participants saw the impact soil health could have on profit over time. Even in a shortened form of the game (played in facilitated 5–10-minute sessions at a career fair booth), players clearly learned that fallow soil was detrimental and that tillage practices matter.

Play test data led to final game definitions of "you're doing great" at 90% soil health after 4 years, "not too shabby" at 80–89% after four years, and "what could you have done differently?" at less than 80% over four years.

While not every player achieved high levels of profit or soil health, we have evidence that nearly every student who engaged with the game enjoyed the experience. Additionally, more than 90% of participants responded with a thumbs up when asked if they would be willing to play again.

Advice to Others

Games are always a great way to engage students in learning (Gee, 2008). Cooperative games are especially valuable, as they help to serve the needs of diverse learning communities. Even early versions of *Plants v. Profits* proved successful at reaching soil health learning goals, but players also responded positively to being a part of the game design process and seeing a game in progress.

If you would like to play *Plants v. Profits* or see the materials it includes, a printable version is available at https://pvp.cemastprojects.org/ (cards, planning and profit sheets, plus optional sad soil tokens). Free copies of the game are also available at the conference.

Costs

Costs associated with this work were primarily for time and effort spent on the project, totaling approximately 180 hours over six months. A few consumable materials were used in the design and revision process, but the methods described here could be accomplished by most organizations, even with a small budget.

The one task we could not have completed without adequate funding was the publication of a polished game, which was made possible by AFRI Competitive Grant No. 2019-69012-29851 from the National Institute of Food and Agriculture.

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author and do not necessarily reflect the view of the USDA.

References

Bagstad, K. J., Reed, J. M., Semmens, D. J., Sherrouse, B. C., & Troy, A. (2016, October). Linking biophysical models and public preferences for ecosystem service assessments: A case study for the southern rocky mountains. *Regional Environmental Change, 16*(7), https://doi.org/10.1007/s10113-015-0756-7

Gee, J. P. (2008). Learning and games. In K. Salen (Ed.), *The ecology of games: Connecting youth, games, and learning* (pp. 21–40). The MIT Press.

USDA. (n.d.). *Soil health management*. https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health/soil-health-management

USDA. (2023). *2023 USDA plant hardiness zone map*. https://planthardiness.ars.usda.gov