

HARVEST: From Seed to Success

INTRODUCTION

Welcome to *HARVEST: From Seed to Success*! This educator guide will explain the fundamentals of the game and provide engaging activities for students. The goal of *HARVEST* is to have students take on several roles of agriculture professionals within the farming community. After completing this interactive game, students should have suitable knowledge of many aspects of the agricultural cooperative. Students will begin by testing soil and determining its composition. Then students will be able to choose a crop that will thrive in the soil composition found. The crops will grow and must be harvested at just the right time. After growing, students will operate a combine to harvest their crops. A final crop yield will be displayed at the end of the game, allowing students to check their score.

WEB-BASED FUNCTIONALITY

When opening the application, a title screen will display with a quick description of the game. Have your students read the description; when ready, they can click start to begin the game. There is also a 'Free Harvest' mode that allows the user to generate a field of any size, choose the crop, and harvest.

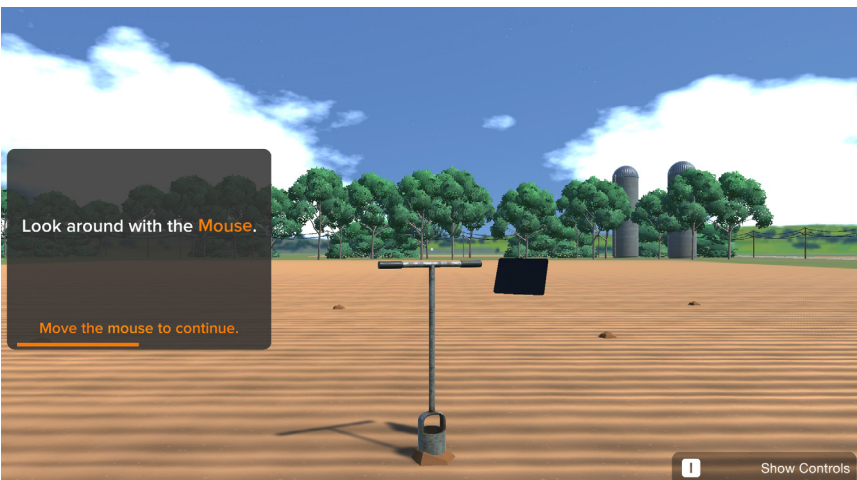


The title screen will have a yellow 'Start' button that will begin the game. You can direct your students to all start at once.



ROLE OF THE AGRONOMIST

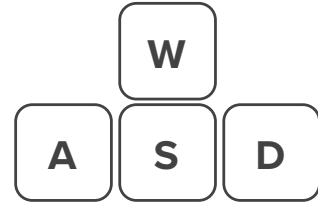
You will be greeted by an on-screen character who explains the goal of the game. They will prompt the player to take a sample of the soil. In this section of the game, the student is an agronomist: a crop scientist. Agronomists study plants and soil and how they can be grown or modified to benefit the community.



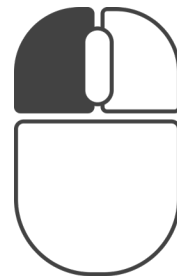
Use the mouse to look around. You may need to click the application, which will focus the mouse only on the game's screen.



Use the **‘W’** key on your keyboard to move forward towards the soil sampler. You may also use the **‘S’** key to move backwards. The **‘A’** and **‘D’** keys can move your agronomist left and right. Make sure to test all the keys to begin sampling.



After you walk up to the soil sampler, left click on the indicator to take a sample.



Once the sample is taken, a tablet screen will appear, inviting the agronomist to send a soil test report to the landowner. Once the student has clicked ‘Send recommendation,’ the soil test report will appear. It will report on the field size, soil texture, and pH of the soil. It will also display the soil nutrients such as nitrogen, potassium, and phosphorus.

ROLE OF THE FARMER

The student now takes on the role of farmer-landowner.

Review the key areas of the Soil Test Report:

- **Soil Texture:** Will vary depending on the soil. Can range from sandy loam to clay in the game. Each seed will have different soils they thrive in.
- **pH:** Measures the acidity or alkalinity of soil. The scale goes from 0 (very acidic) to 14 (very alkaline). Acidic soils (pH < 7) are common in areas with high rainfall which can leech away alkaline nutrients. Alkaline soils (pH > 7) are generally found in more arid regions where evaporation exceeds rainfall and leaves behind alkaline salts. The optimal range for most plants is 6.0–7.5 on the pH scale.
- **Nitrogen:** Primary form of nutrients available to plants. Essential for plant growth (synthesis of amino acids, proteins, and chlorophyll).
- **Potassium:** An essential nutrient important for water regulation, enzyme activation, and disease resistance.
- **Phosphorus:** Essential nutrient for energy transfer, root development, and flowering/fruiting.

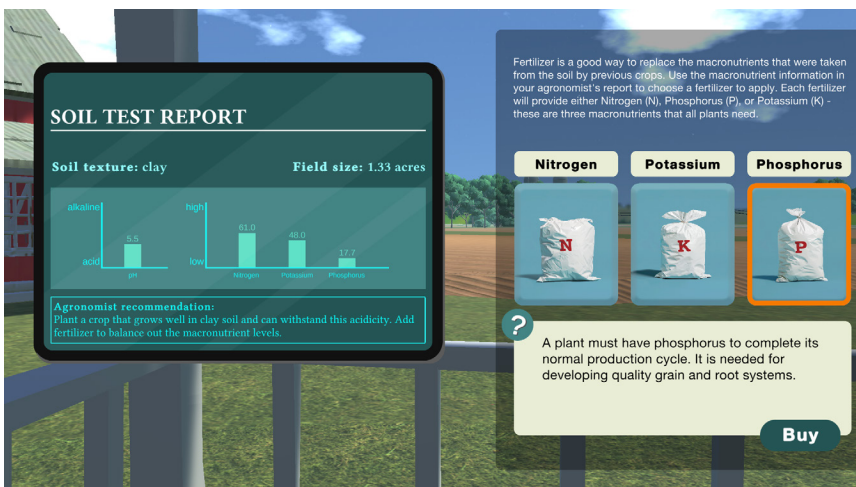


Now students will choose which crop to grow based on the agronomist's report.

The farmer can choose between wheat, soybeans, and corn. Each seed has different requirements for soil texture and pH. Have students read through each seed's description and choose the best seed based on the data.

BREAKDOWN OF EACH SEED

- **Wheat** can grow in sandy soil with proper irrigation. Wheat will grow optimally in a deep soil at a pH between 5.5 and 7.5.
- **Soybeans** ideally grow in a well-draining loam with lots of living organisms and a pH between 6.0 and 7.0.
- **Varieties of corn** can be grown in silty/clay soil. Corn prefers acidic and neutral soil with a pH between 5.5 and 6.5.



SOIL TEST REPORT

Soil texture: clay Field size: 1.33 acres

alkaline
acid 5.5 pH

high
low 51.0 48.0 7.7

Nitrogen Potassium Phosphorus

Agronomist recommendation:
Plant a crop that grows well in clay soil and can withstand this acidity. Add fertilizer to balance out the macronutrient levels.

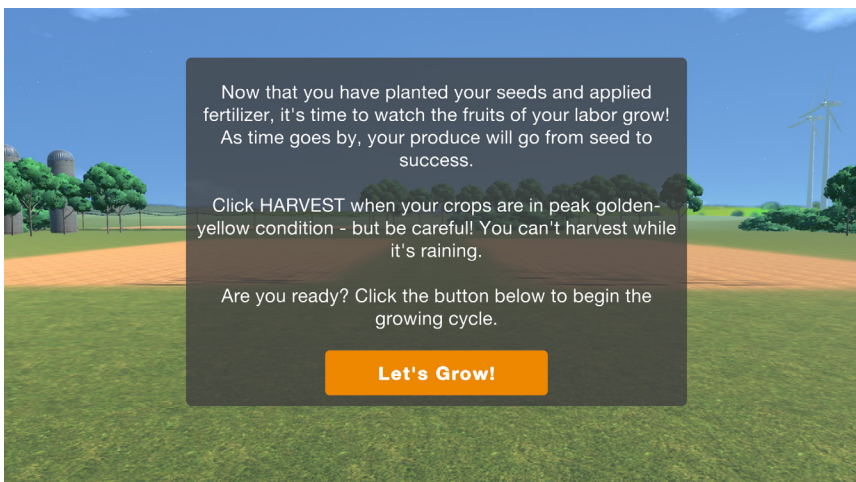
Fertilizer is a good way to replace the macronutrients that were taken from the soil by previous crops. Use the macronutrient information in your agronomist's report to choose a fertilizer to apply. Each fertilizer will provide either Nitrogen (N), Phosphorus (P), or Potassium (K) - these are three macronutrients that all plants need.

Nitrogen **Potassium** **Phosphorus**

A plant must have phosphorus to complete its normal production cycle. It is needed for developing quality grain and root systems.

Buy

After the seed has been chosen, a nutrient will need to be added to the soil. A selection of fertilizers that contain nitrogen, potassium, and phosphorus can be chosen. The best method is to add the nutrient that is the least abundant in the soil.



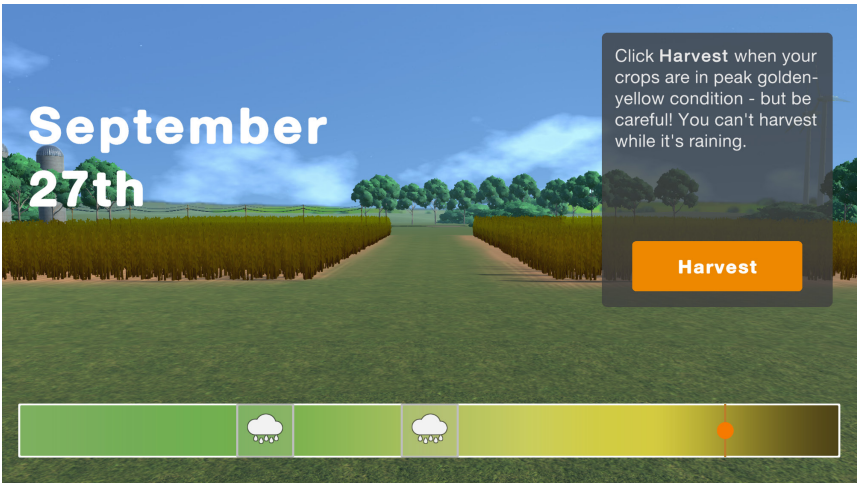
Now that you have planted your seeds and applied fertilizer, it's time to watch the fruits of your labor grow! As time goes by, your produce will go from seed to success.

Click HARVEST when your crops are in peak golden-yellow condition - but be careful! You can't harvest while it's raining.

Are you ready? Click the button below to begin the growing cycle.

Let's Grow!

The next step is to watch the seeds mature into fully grown crops. You will see the dates change as the crops grow. When you are ready, click **'Let's Grow!'**



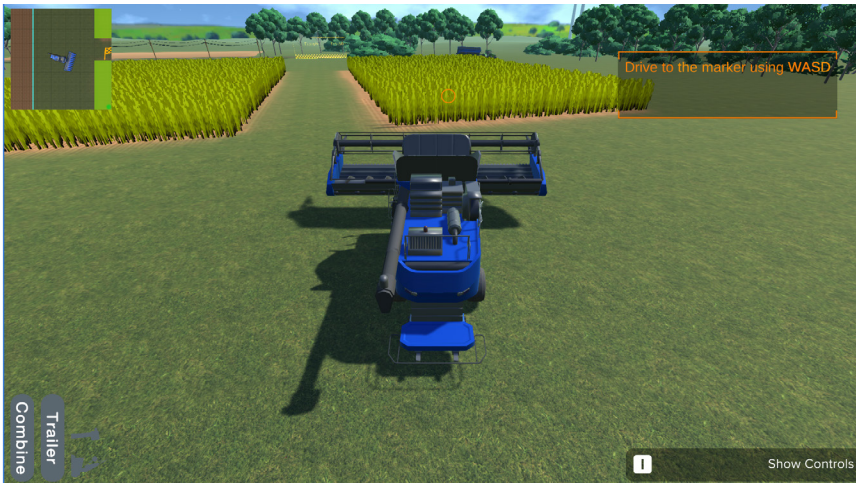
There will be a bar at the bottom showing the passage of time. You will not be able to harvest during rainy days. The on-screen text will tell students what signs to look for, to tell them when the produce is ready for harvest.



If you allow all the time on the bottom bar to pass without harvesting, your crops will decay and therefore, you will be unable to harvest. You will need to attempt the harvest again and harvest at a more opportune time.



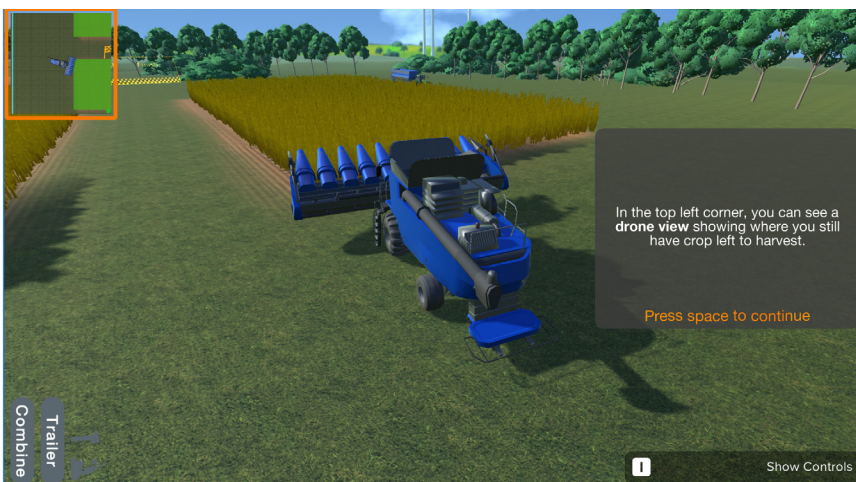
Once you choose a day to harvest, the player will be placed in a combine harvester. The vehicle can harvest mature crops.



The header of the combine will automatically lower to the ground when approaching the field. The header takes the crop from the soil. The crop will end up in the combine harvester's hopper. The combine hopper can become full and grain must be transferred into the trailer, which is being pulled around the field by a tractor. The auger will extend automatically—it transfers the crop into the trailer.



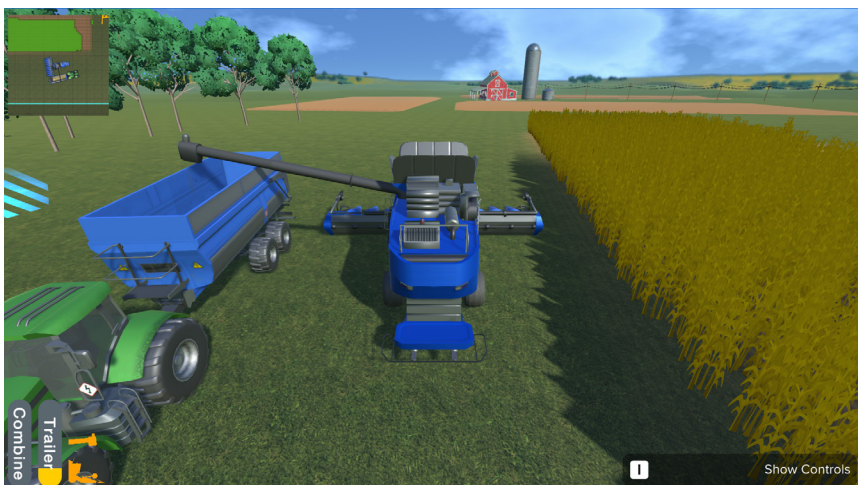
To move the tractor, use the **WASD** keys. The keys will need to be tested before the harvesting can begin.



In the top corner, there is a map that will show the field from above and indicate where you have crops still left to harvest.



There are meters in the left-hand corner indicating the capacity remaining for the combine harvester and the trailer. As you drive around the field, the combine’s hopper will fill up. The auger must be used to empty the combine’s contents into the trailer, which is being pulled by a tractor at the edge of the field.



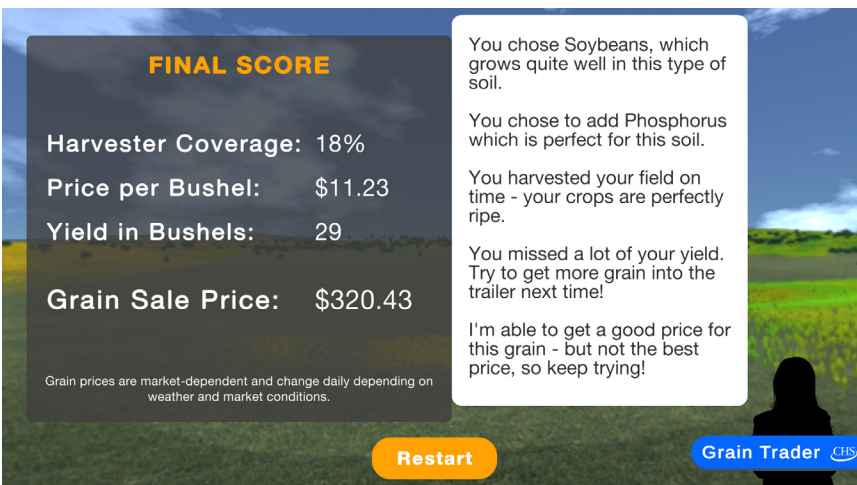
Ensure that the auger is above the trailer and press the ‘F’ key. This will empty the crop into the trailer, allowing the combine to continue harvesting without being full. Make sure not to spill anything! You can turn off the auger flow by pressing the ‘F’ key again.



The picture to the left shows an example of how the auger flow looks after pressing the ‘F’ key. Make sure to get the crop into the trailer or the valuable harvested materials will be lost.



Once the crop is completely harvested, drive through the 'Finish' barrier. This will complete the harvest and send the crops off to shipment. Final scores will appear, and the grain trader will give you a full report on what was ideal and what needs improvement.



**Grain prices may not be representative of real-world value. Grain price is a 3-year average of 2021-23 crop years. Grain prices are market-dependent and change daily depending on weather and market conditions.*

ACTIVITIES

Once the initial run-through has been completed, additional activities can be pursued to further expand the gameplay and keep students returning to learn more about growing and harvesting crops.

DELIBERATE MISTAKES AND ANALYSIS

Objective: Understand the impact of incorrect choices on crop yield and health.

Setup: Have students play the game again, this time deliberately choosing the incorrect seed for the soil conditions provided.

Discussion: After the game, have students discuss and analyze how the incorrect seed choice affected the crop growth and yield. Focus on specific reasons why the chosen seed did not thrive:

- Which seed did you choose and why was it the incorrect seed for the soil?
- Which seed would normally thrive in this soil and why?
- How did the pH impact the growth of the crop?
- How did the soil nutrients impact the growth of the crop?
- How could this harvest impact the community relying on it?

Highlight the differences in outcomes and underlying reasons for different trials the students conduct.

NUTRIENT DEFICIENCY

Objective: Explore the effects of nutrient deficiencies on crop growth.

Setup: Have students play the game but choose not to add the specific nutrient the soil lacks (either potassium, nitrogen, or phosphorus).

Analysis/Discussion: After harvesting, compare the results with previous playthroughs where the appropriate nutrient was added. Discuss the role each nutrient has in crop growth. Have students with different added nutrients partner up and have them discuss these questions:

- What nutrient did you add and why was it incorrect for your soil?
- How did it impact your crops?
- What nutrient did your soil need?
- Why did the lack of that nutrient cause your crops to not reach their full potential?

HARVESTING TIMES

Objective: Understand the impact of harvest timing on crop yield and quality.

Setup: Start with a simple discussion on the importance of harvest timing in agriculture. Divide students into three groups. Each group will play the game, selecting optimal seeds and soil, but harvest at different times:

- Group A: Harvests very early. (Close to the start of the time bar.)
- Group B: Harvests on time. (Close to the middle-right in the time bar.)
- Group C: Harvests just before time runs out. (At the very right of the time bar.)

Analysis/Discussion: Have each group record their data for crop yield, crop quality, and the economic return for each student. Have students within the same group discuss their common findings. Then, bring the discussion to the classroom. Have students discuss the consensus among each group.

- What were the main differences observed between the three harvest timings?
- What are the differences in yield, quality, and profitability for the three harvest timings?
- What is the importance of knowing the correct harvest time?
- What are some real-world factors that might influence a farmer's decision on when to harvest? (For example: heavy rain.)

LEARNING EXTENSION AND ENDLESS GAMEPLAY

FREE HARVEST MODE

This mode allows students to determine field settings by inputting the width and height of their field size. Students may then choose the crop they want to plant in their field. Afterward, they can harvest their crop using the combine. This freeplay mode allows students to consider multiple variables and put what they learned into action.