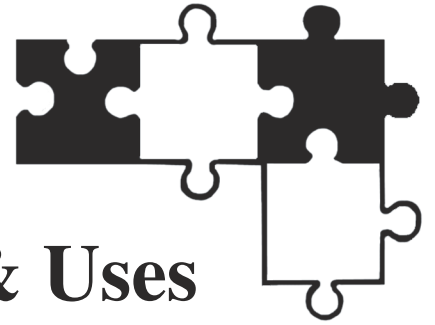


ACTIVITY 8

The PAYBACK Game: Soil Requirements & Uses



Activity:

Students will participate in a game that shows how nutrients are withdrawn from the soil as food is grown or produced and how the soil is regenerated with nutrients.

Curriculum Fit:

Grade Four - Science

- Topic A: Waste and Our World
 - Identify plant and animal wastes and describe how they are recycled in nature
- Topic E: Plant Growth and Changes
 - Recognize that plant requirements for growth (e.g. nutrients) vary from plant to plant

Agriculture Concepts:

Importance of soil and water

Cognitive Level:

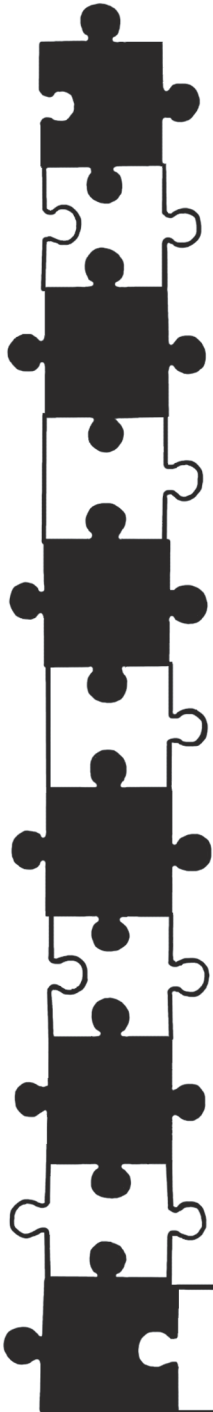
Application, Analysis

Materials Required:

Monopoly money, draw box for cards.

Time Required:

One class period.



Background — For the Teacher

This game is not competitive but should be educational. It gives students the chance to make decisions for the benefit of the soil. There is also an element of “chance” to keep it interesting. It should be noted that this game makes no claims to being accurate on economic aspects; rather, the focus of the game is on demonstrating soil needs.

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Note: There are a variety of nutrients in the soil such as nitrogen, phosphate, potassium and other micro-nutrients. However, for simplicity's sake only general nutrients "N" will be discussed.

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Procedure

Preparation

1. Use the Resource Sheets to make sufficient copies of the cards, charts, and rules. You may want to laminate the cards.

Introduction

2. Introduce soils and explain that as we take nutrients out we need to give back to the soil.
3. Discuss three ways to replace nutrients to the soil. They are:
 - a) Manure: spread on land from feedlot waste — very effective, inexpensive, but limited supply.
 - b) Green manure: growing specific crops strictly to plow them back into the soil.
 - c) Chemical fertilizer: relatively expensive but the land can be put into crop annually.

Activity

4. Hand out and discuss the rules of the game.
5. Play the nutrient game. Allow approximately thirty minutes of playing time.

Conclusion

6. Discuss the outcome of the game and what the class has learned from it.

Discussion Questions

(Comprehension)

1. What is the least expensive method of “paying back” the land?

(Should include the cost of not harvesting a crop during the green manure crop/plowdown scenario, i.e., opportunity cost.)

(Application)

2. What are the advantages and disadvantages of (a) manure (b) green manure (c) chemical fertilizers?

(Analysis)

3. What happens to land that is never replenished?

(Evaluation)

4. Which method of fertilization would be preferable to a dairy farm?

Student/Teacher Resource Sheet #1

How to Play the Nutrient Game

1. Divide class into groups of 4 to 6 students.
2. Each group chooses a banker and the remaining players are farmers.
3. The banker is given a package of material containing one set of "Crop cards", one set of "Soil type cards", one set of Monopoly money, a "Crop/Soils/Yield/Chart" and a "Nutrients Cost Chart".
4. The first player draws a "Crop Card" and a "Soil Type Card", records them both on paper and returns them to their respective boxes.
5. The banker declares the yield and pays the farmer for his crop with Monopoly money. One dollar equals one bushel of product, eg. 50 bu crop = \$50.00 money.
6. Now the farmer must decide how to replace the nutrients used by the crop which is also revealed to him by the banker from the "Crop/ Soils/ Yield/Chart".

Options are:

- a) Purchase manure from a local feedlot and spread it on the land. This is inexpensive but there is a very limited supply. If the player chooses this option he/she pays 1/2 bu for each nutrient (N) required. Example: If farmer raised Oats on medium loam he/she received \$70.00 (70 bu). Now the soil required 20 N in return. If manure is chosen the farmer pays 1/2 bu for each N or \$10.00 for 20N. Once all the manure is used up there is no more!! The banker can only issue a maximum of 100N of manure. The banker will keep a tally on a sheet subtracting the amount of natural N (manure) used until the supply (100N) is depleted.
 - b) Grow Green Manure - the farmer could elect to seed a crop, let it grow next year, then plow it in. This method will cover any requirement for N; however, although it costs nothing in money, the farmer misses the next crop year. If he/she continues this practice, they only get a crop (turn) every other round.
 - c) Purchase Chemical Fertilizer - the farmer could elect to purchase chemical fertilizer. It is more expensive than manure but it has an unlimited supply and you can crop every year or never miss a turn. Cost is \$1 N = 1 bu. If a farmer requires 20N he pays \$20 (bu) and continues cropping (playing).
7. The game continues by these rules until time up is declared. If someone can not replace the N used by the crop they are bankrupt and must quit farming. The winner is declared by the most amount of crop in the bin at completion (or \$ in hand).

CROP CARDS

Each group has a complete set of crop cards. As a farmer draws a card, it is recorded by the farmer in addition to a soil type card, then replaced in the box.

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

BARLEY

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

BARLEY

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

WHEAT

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

WHEAT

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

OATS

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

OATS

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

CANOLA

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

CANOLA

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

FLAX

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

FLAX

Crop Card - Crop Card - Crop Card - Crop Card - Crop Card - Crop Card

SOIL TYPE CARDS

Each group has a complete set of Soil Type Cards. As a card is drawn by a player, it is recorded and returned to the “Soil Types” box. This card in combination with the “Crop Card” will allow the banker to calculate the nutrient loss and yield on the crop.

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

**LIGHT
SANDY**

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

**LIGHT
SANDY**

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

**MEDIUM
LOAM**

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

**MEDIUM
LOAM**

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

**HEAVY
CLAY**

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

**HEAVY
CLAY**

Soil Type Card - Soil Type Card - Soil Type Card - Soil Type Card

Student/Teacher Resource Sheet #2

Crop/Soils/Yield Chart

Crop Type	Light Sandy	Medium Loam	Heavy Clay	Crop Yield (Bu)
Barley	20N			50 Bu
		10N		70 Bu
			20 N	60 Bu
Wheat	20N			40 Bu
		10N		60 Bu
			20N	50 Bu
Oats	30N			50 Bu
		20N		70 Bu
			20N	60 Bu
Canola	10N			20 Bu
		20N		40 Bu
			10N	30 Bu
Flax	10N			30 Bu
		20N		50 Bu
			20N	40 Bu

NUTRIENTS COST CHART

Manure - Natural Nutrients - Limited supply

Cost: 1 N = 1/2 Bu Crop every year

Green Manure - Crop every other year

Cost: 1 year of green crop (miss a turn)

Chemical Fertilizer - Unlimited Supply

Cost: 1 N = 1 Bu Crop every year

Manure depletion tally

