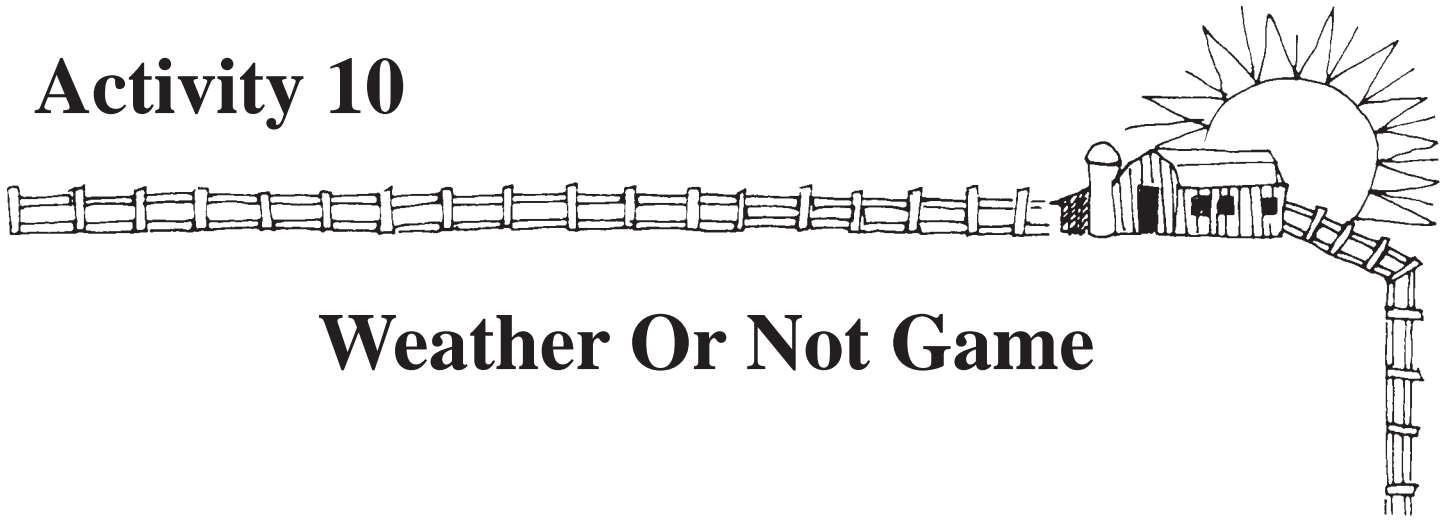


Activity 10



Weather Or Not Game

Activity:	Students play a game which illustrates the effects of weather on crop growth and therefore on economic returns to farmers
Curriculum Fit:	Science - Grade 5 <ul style="list-style-type: none">• Topic D: Weather Watch Science - Grade 6 <ul style="list-style-type: none">• Topic C: Sky Science Mathematics - Division 2 <ul style="list-style-type: none">• Long multiplication skills
Agriculture Concepts:	Importance of Soil & Water Economic Importance Diversity
Cognitive Level:	Application, Analysis
Materials Required:	Assembled game board and accessories (supplied) Token farmers (4 - 6) One dice One copy of tally sheets per player Pencil Calculator to assist with math if desired
Time Required:	Two class periods.

Background — For the Teacher

This game focuses on the weather factors which influence the agricultural industry in Alberta.

The lesson consists of two options for game rules based on math skills difficulty level.

Option A (the main rules) focuses on math skills that are complex and is recommended for grade five or six students with “good” math skills.

Option B (the modified tally sheet and scoring system) will still demonstrate the effects of weather but can be easily played by grade four students. To play this version, the players disregard the price sequences at the end of the game board.

Procedure

Introduction

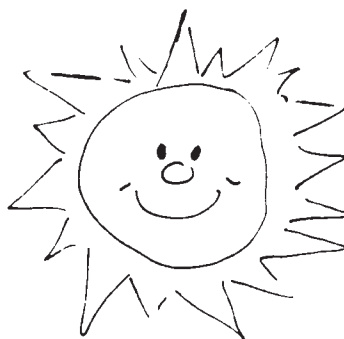
1. The lesson may begin by discussing today’s weather. Is it good or bad? What season is it? Is this the kind of weather we expect in this season? How do you feel about weather? How does weather affect your life?
2. Discuss some people whose lifestyles are influenced by the weather. (Fire fighters, park officials, resort owners, airline pilots, road construction workers, farmers, etc.)
3. The exercise today is a game of chance. This game reflects a real life situation. It will help us to appreciate the economic effects weather has on one of Alberta’s largest industries - agriculture.

Activity

4. Divide the class into groups of 4 - 6 students.
5. Discuss with the class the rules of the game. Make sure that each group has a copy of the rules and a game set.
6. Each group will require 2 dice and each member of the group should have a token “man” which he will use to play the game. These are not supplied with the kit. Each player must be able to identify his own token.
7. To keep score we will be using crop prices for agricultural products.
8. Establish the grain prices on the tally sheet using either of the following methods:
 - a) Roll the die and choose good, average or poor prices according to the following guide.

Die Roll	1 or 2 <u>poor</u>	3 or 4 <u>average</u>	4 or 6 <u>high</u>
Wheat	2.75 unit	3.00 unit	4.50 unit
Oats	.75 unit	1.00 unit	1.50 unit
Hay	1.00 unit	2.00 unit	3.00 unit
Canola	5.00 unit	6.50 unit	8.00 unit
Barley	.85 unit	1.75 unit	2.50 unit

- b) Call Alberta Wheat Pool, a local elevator or feed distributor for current grain and hay prices and fill these in the tally sheet.
9. Enter established crop prices on the tally sheets.
 10. Play the game using Games Rules - Option A or Option B.



STUDENT RESOURCE



Game Rules - Option A

1. **Read** all the rules carefully before proceeding with the game.
2. All calculations should be done after the player gets to the finish. Do not add in advance. You will have to do it again. Use a calculator to assist you if your teacher permits.
3. Enter established crop prices on tally sheet.
4. **To start** - roll the die. The player with the highest count goes first.
5. **Advancing tokens** around the board. On your turn, roll the die and move your token the number of squares indicated. If you land on a season square, you must roll to find the weather conditions. The particular season is indicated on each square.
6. **Weather conditions and crop yields.** After each move the player must roll again to find out the weather conditions. If a player's token has arrived on a "spring" square, he/she must roll the die and then look on the **Spring** weather conditions guide and follow the directions indicated by the number of his/her roll. These will be recorded on his/her tally sheet under the grain field that he/she is in at the time.

Example: Player 1 has a token on Summer barley. He/she rolls the die and turns up a 3. The summer weather conditions guide tells him/her that the weather is "Warm August, crops maturing well," + 30 Units of crop. The player will then enter 30 on the plus side of his/her tally sheet for barley.
7. **Crop Insurance.** If a player lands on a "crop insurance" square, he/she may purchase crop insurance by placing -10 on the losses side of his/her tally sheet. If he/she chooses to take out crop insurance, the next crop loss condition that he/she rolls is not recorded on the tally sheet. Do not roll for weather conditions when on a "crop insurance" square.
8. Do **not** pass the solid dark square until you have established your crop yield by doing the following:
Each time a player gets to a solid dark square (the last square of each field) he/she must roll the die to find his/her crop yield. Multiply the number shown on the die by 100 to get his/her crop yield for that field. After entering this number on the tally sheet as a gain, he/she may then proceed to the new field.

Do not calculate crop yields or crop values until the end of the game!
9. **Crop Values.** When a player has moved out of the field, he/she will still be at the mercy of the weather. Some squares will indicate favourable and unfavourable weather conditions for crop values. He/she will then find if he/she gets a bonus or a penalty on his/her crop values. These must be established before final calculations of net worth are made. These **losses or bonuses apply to all crops.**

Example: a bonus for "seed" quality may make all of his/her crops worth \$.50 more per unit.
10. Players finishing first receive a bonus of 100 units of **each** crop. Players finishing second receive a bonus of 50 units of **each** crop.
11. **The winner** is the player who has accumulated the most valuable crops as indicated by the Total Crop Value on the final tally sheet. You may wish to work through these calculations as a group after all players have completed one trip around the game board.



STUDENT RESOURCE

Weather Conditions

OPTION A

Spring Weather Conditions Guide

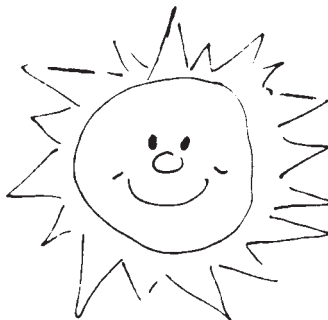
- | | |
|---|---------------|
| 1. Excellent warm weather | + 50 Units |
| 2. Dry, windy weather; causes soil erosion | - 30 Units |
| 3. Good conditions; finished seeding early | +100 Units |
| 4. Cool spring; late germination | - 50 Units |
| 5. Heavy rain; tractor stuck in mud | - miss a turn |
| 6. Hot dry windy spring; sparse germination | - 25 Units |

Summer Weather Conditions Guide

- | | |
|--|------------|
| 1. Three day gentle rain, mid-June | + 50 Units |
| 2. Warm sunny weather | + 50 Units |
| 3. Warm August; crops maturing well | + 30 Units |
| 4. Heavy hail; extensive damage | -100 Units |
| 5. Hot weather, causes drought | - 75 Units |
| 6. Cold, wet August; crops mature slowly | - 25 Units |

Fall Weather Conditions Guide

- | | |
|--|----------------|
| 1. 10 day dry spell in September; harvest ° complete | +100 Units |
| 2. Rainy September | - miss 2 turns |
| 3. Warm windy weather | + 75 Units |
| 4. Snow in early October | -100 Units |
| 5. Early evening dew; slows harvest | - 25 Units |
| 6. Late frost; good grain yield | + 50 Units |



Tally Sheet - Option A

WHEAT	+Gains	-Losses		
			CANOLA	+Gains
				-Losses
	Basic Wheat Price:			Basic Canola Price:
	Add or subtract bonus or penalty			Add or subtract bonus or penalty
Total	Wheat price		Total	
Subtract losses	x <u>Wheat Yield</u>		Subtract losses	Canolaprice
Wheat Yield:	CROP VALUE		Canola Yield:	x <u>Canola Yield</u>
				CROP VALUE

OATS	+Gains	-Losses		
			BARLEY	+Gains
				-Losses
	Basic Oat Price:			Basic Barley Price:
	Add or subtract bonus or penalty			Add or subtract bonus or penalty
Total	Oat price		Total	Barley price
Subtract losses	x <u>Oat Yield</u>		Subtract losses	x <u>Barley Yield</u>
Oat Yield:	CROP VALUE		Barley Yield:	CROP VALUE

HAY	+Gains	-Losses		
			Wheat Crop Value:	
	Basic Hay Price:		Oat Crop Value:	
	Add or subtract bonus or penalty		Hay Crop Value:	
Total	Hay price		Canola Crop Value:	
Subtract losses	x <u>Hay Yield</u>		Barley Crop Value:	
Hay Yield:	CROP VALUE		TOTAL CROP VALUE:	



STUDENT RESOURCE

Game Rules - Option B

1. **Read** all the rules carefully before proceeding with the game.
2. Players must not calculate crop values before the entire game is finished. When playing option B, disregard the directions on the last 6 squares of the board.
3. Choose one player to act as a weather person. This person may play the game as well. It is important that the weather person read **all of the weather conditions out loud** to the group so that players learn how the **weather** is affecting their crops.
4. **To start** - all the players roll the die. The player with the highest count goes first.
5. **Advancing tokens** around the board. On your turn, roll the die and move your token the number of squares indicated. If a player lands on a season square, he/she must roll to find the weather conditions. The particular season is indicated on each square.
6. **Weather conditions** and crop yields. After each move the player must roll again to find out the weather conditions. Ask the weather person to read the weather conditions and the crop gains or losses out loud. The player will then enter the results on his/her tally sheet under the grain field that he/she is playing at the time.
7. **Crop Insurance.** If a player lands on a “crop insurance” square, he/she may purchase crop insurance by debiting his/her crop 1. If he/she chooses to take out crop insurance, the next crop loss condition that he/she rolls is not recorded on the tally sheet. **Do not roll for weather conditions.**
8. Players must **not** pass the solid dark square until they have established their crop yield. Each time a player gets to a solid dark square (the last square of each field) he/she must roll the die to find his/her crop yield. Multiply the number shown on the die by 10 to get his/her crop yield for that field, proceed to the new field.
9. Players finishing first receive a bonus of 2 Truckloads of **each** crop.
Players finishing second receive a bonus of 1 Truckload of **each** crop.
Enter these bonuses on the tally sheet under gains for each crop played before doing final calculations.
10. **The winner** is the player who has accumulated the most truckloads of crops.

Example: Player 1 has a token on Summer barley. He/she rolls the die and turns up a 3. The summer weather conditions guide tells him/her that the weather is “Warm August, crops maturing well” + 1 Truckload.

The player will then enter 1 on the plus side of his/her tally sheet for barley.

STUDENT RESOURCE



Weather Conditions

OPTION B

Spring Weather Conditions Guide

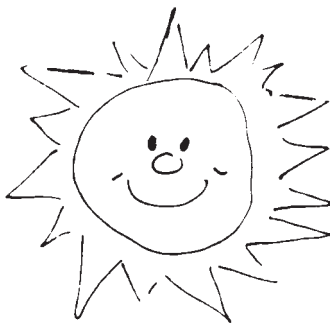
- | | | |
|---|-----|---------------|
| 1. Excellent warm weather | + 2 | Truckloads |
| 2. Dry, windy weather; causes soil erosion | - 1 | Truckload |
| 3. Good conditions; finished seeding early | + 4 | Truckloads |
| 4. Cool spring; late germination | - 2 | Truckloads |
| 5. Heavy rain; tractor stuck in mud | - | miss one turn |
| 6. Hot, dry, windy spring; sparse germination | - 1 | Truckload |

Summer Weather Conditions Guide

- | | | |
|--|-----|------------|
| 1. Three day gentle rain, mid-June | + 2 | Truckloads |
| 2. Warm sunny weather | + 2 | Truckloads |
| 3. Warm August; crops maturing well | + 1 | Truckload |
| 4. Heavy hail; extensive damage | - 4 | Truckloads |
| 5. Hot weather; causes drought | - 3 | Truckloads |
| 6. Cold, wet; August crops mature slowly | - 1 | Truckload |

Fall Weather Conditions Guide

- | | | |
|--|-----|---------------|
| 1. 10 day dry spell in September; harvest ° complete | + 4 | Truckloads |
| 2. Rainy September | - | miss one turn |
| 3. Warm, windy weather | + 3 | Truckloads |
| 4. Snow in early October | - 4 | Truckloads |
| 5. Early evening dew; slows harvest | - 1 | Truckload |
| 6. Late frost; good grain yield | + 2 | Truckloads |



Tally Sheet - Option B

	+Gains	-Losses
WHEAT		
Total		
Subtract losses		
Wheat Yield:		

	+Gains	-Losses
CANOLA		
Total		
Subtract losses		
Canola Yield:		

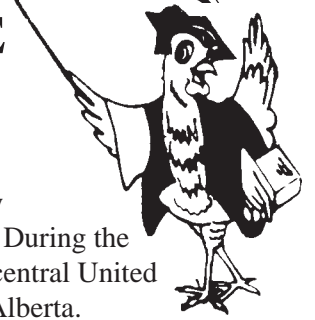
Wheat Crop Yield: _____
 Oat Crop Yield: _____
 Hay Crop Yield: _____
 Canola Crop Yield: _____
 Barley Crop Yield: _____
 Price: \$100.00/Truckload
 TOTAL CROP VALUE: _____

	+Gains	-Losses
OATS		
Total		
Subtract losses		
Oat Yield:		

	+Gains	-Losses
BARLEY		
Total		
Subtract losses		
Barley Yield:		

	+Gains	-Losses
HAY		
Total		
Subtract losses		
Hay Yield:		

TEACHER RESOURCE



THE CLIMATE

Farming in a northerly latitude in a region with a continental type of climate such as Alberta's is strongly affected by numerous factors such as the frost-free period, precipitation, amounts and dryness of winds, heat units, hours of daylight, and so on.

For large parts of the occupied areas of Alberta, weather records for about 100 years are available and farming has been practiced for 50 to 75 years in the major agricultural areas of the province.

The combination of meteorological data, accumulated farming experience and increasingly detailed knowledge of Alberta soils obtained by soil surveys has enabled the preparation of an agro-climatic map.

The interior location of the province on the continental mass results in greater heating in summer and cooling in winter and in less precipitation than is present in marine areas. Mountain barriers to the west inhibit the flow of mild moist air from the Pacific, ease the flow of cold air from the north in winter, and warm air from the southeast in summer. The warm Pacific and cold Hudson Bay currents contribute to downward southeast to northeast temperature gradients.

Alberta's latitude places the province under the influence of prevailing westerlies aloft at about 6 km (20,000 feet). Migrating low pressure areas, caught in the westerlies aloft, usually cross the province. Systems, often called storm centres, lose much of their moisture on the western slopes of the mountains and consequently bring only meagre precipitation to Alberta. Occasionally, however, once it has crossed the mountains such a storm center may intensify significantly and produce widespread rain. In most years three or four of these systems developing in spring or early summer provide the main moisture base for the growing season.

When the winds aloft shift to north or northwest, cooler air masses enter the province from the Northwest Territories. If this happens in winter the result is usually a cold outbreak. Blizzards occasionally accompany such outbreaks.

Southerly winds aloft are usually accompanied by warm weather. During the summer hot humid air from the central United States can spread into southern Alberta.

Alberta is too far inland to enjoy the moderating influence of the Atlantic Ocean or the Gulf of Mexico. The Pacific Ocean, however, exerts profound influence on the climate. However, the environmental variability is extreme in Alberta, the land being from 240 to 1,200 m (800 to 4,000 ft) above sea level in the plains region and over 2,400 m (8,000 ft) in the mountains. Most of the province receives from 300 to 500 mm (12 to 14 in) of annual rainfall as well as varying amounts of snow usually corresponding to some 50 to 150 mm of water. The number of frost-free days ranges from fewer than 60 to over 125 per year.

In the winter, cold polar continental air masses which move down over Alberta are frequently modified in the southwest by mild air from the Pacific to which the heat of condensation from heavy snowfall in the mountains and adiabatic heat from the descent down the eastern slope have been added. This produces the chinook wind, which is dry. Rapid melting and evaporation take place during chinooks. A chinook wind can cause a rise of 25 to 35°C in a few hours time. The significance of the wind for agriculture lies in its ability to clear snow from grazing land, thus allowing cattle to feed in the fields in winter. On the other hand, it has a severe drying effect in spring and summer so contributes to wind erosion. The alternate thawing and freezing of winter chinooks have a detrimental effect on trees, shrubs and forest cover by causing winter kill. Because of the strong winds, strip farming is practised in parts of southern Alberta. This agricultural method originated as a result of the joint efforts of Alberta soil scientists and farmers in the 1930's who sought a solution to wind erosion problems in farm fields. Damaging winds are most common with consequent soil erosion, lodging of crops, increased heat requirements for people and livestock, wind chill and visibility changes.

TEACHER RESOURCE



Precipitation

In general, agricultural areas get two-thirds of their annual precipitation in the months of May to September. The annual snowfall contributes roughly one-third of the total precipitation. As a rule of thumb, 1 cm of snow equals to 1 mm rain (or 10 in. of snow equals 1 in. of rain).

Snow does not always contribute to the moisture base as it is often evaporated by the chinooks in the south. In the Peace River region, heavy spring runoff wastes much of the moisture from snow. Areas with a likely moisture deficit require utilization of dryland farming techniques. "Moisture deficit" is based on the difference between potential evapotranspiration (if moisture were not limited) and the estimated available moisture (precipitation and soil-stored moisture).

Hail

Parts of Alberta have some of the highest hail frequencies in the world. Hail occurs within 145 km (90 miles) of Penhold on an average of 61 days in a year. Hail activity is greatest between June 20 and August 10. Normally 20% of a year's damage occurs on a single day and 50% on the season's four worst hail days.

The Alberta Hail Project operating out of Penhold is capable of seeding rainclouds as part of a weather modification program intended to reduce hail.

Temperature

Summer temperatures do not limit crop production in northern areas as much as might be expected since long daylight hours in the north compensate for the lower temperatures. For example, Fort Vermilion has 538 daylight hours in July and a mean temperature of 16°C (61°F), while Lethbridge has 488 daylight hours and a mean temperature of 19°C (66°F). The number of degree days and the frost-free period are especially significant for crop production.

A "growing degree day" occurs when the mean temperature for that day exceeds 42°F by at least one degree. The total number of growing degree days during a growing season accumulates and indicates the amount of heat available for crop growth. Wheat growing is not considered practical with fewer than 2,000 "growing degrees" in a year.

The number of days between the last freezing temperature of the spring and the first frost in the fall is the frost-free period. A light frost usually does little harm but a killing frost, defined as -2°C (28°F) usually causes damage. The killing frost-free period is generally 3 to 4 weeks longer than the frost-free period.

(This Land of Alberta - Alberta Agriculture, Food & Rural Development)