Bushels or Bust
Variables That Determine Profit
*Adapted from Kentucky Corn Growers Association

Audience: 4th and 5th -grade math students

Activity Length: 30-45 minutes (to be completed after a lesson on inputs/outputs, variables, profit)

TEKS: Math
4.1.A. Apply mathematics to problems arising in everyday life, society, and the workplace
4.1.C. Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems
4.1.E. Create and use representations to organize, record, and communicate mathematical ideas
4.4.A. Add and subtract whole numbers and decimals to the hundredths place using the standard algorithm
4.4.H. Solve with fluency one- and two-step problems involving multiplication and division, including interpreting remainders
5.1.A. Apply mathematics to problems arising in everyday life, society, and the workplace
5.1.C. Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems
5.1.F. Analyze mathematical relationships to connect and communicate mathematical ideas
5.9.A. Represent categorical data with bar graphs or frequency tables and numerical data, including data sets of measurements in fractions or decimals, with dot plots or stem-and-leaf plots

Introduction:
There are many variables in agriculture that determine profit. This activity is designed to introduce students to some of those risks. Farmers use math every day as they make decisions about their operation and analyze at the results. This game allows students to see factors that can affect yield, or how much they produce.

Farmers can control some inputs to increase profit. Such inputs include seed type, fertilizer usage, labor, and irrigation usage, if available. Things they can't control include pests, weather, markets, governmental policies and premiums or discounts for their crop at market. Supply and demand run the market for each agricultural product and decide the price. Supply and demand have inverse reactions, meaning if one goes up the other goes down. This game allows students to experience the farmer's risks and rewards, as they make decisions about their own crop.

Vocabulary:
- Variables-the factors that cause a change
- Yield-the amount that a crop produces
- Income-the amount of money the farmer receives from the sale of the crop
- Costs-the amount of money the farmer had to pay to produce the crop
- Profit-the amount of money a farmer makes after costs are subtracted from total income

Materials:
- Budget sheet for each team or individual (below)
- Dice for each team or individual
- Calculators (optional)

How to play:
1. Divide the class into teams of 2 to 6 students. Each team will represent a farm family.
2. Hand each team a budget sheet to record the changes in yield or the amount of corn produced, price received for their corn crop and cost per acre to grow their corn.
3. The decisions the teams need to make are in white. There are some boxes that give the option for additional cost in exchange for an increase yield. The decision is to be made at that time, and it will not be known until the end of the game if the decision was beneficial.
4. Other steps require the teams to roll the dice to determine the risk that their farm family will take. These are accurate risks that farmers face. Risks include planting, pests, weather, markets and harvest outcomes.
5. Each team should keep track of their values at each step. Profit will be calculated at the end of the game.
6. The team with the highest net profit wins the game.
7. Multiply the net profit by 523 acres, the average size farm in Texas. Discuss the outcome with your students.
8. When the game concludes, discuss risks that are associated with farming.
    a. How would your students handle those risks if it was their farming practice?
    b. How would those risks look every year?
    c. Would they follow the same path or differ from year to year?
    d. What are some ways they could help to reduce those risks?
9. Create a class bar graph that utilizes the profits from each group to represent the difference in profit from one farmer to the next based on the different variables (risks) they encounter throughout the year.

TEXAS FARM BUREAU®

Name_____ Date_____

Welcome to the game of luck and smart thinking- the game of farming. Use the chart to monitor your crop's progress while you roll the dice for your outcome. When you roll the dice, enter the outcome into your chart. At the end, the team or person with the highest profit wins!

	Yield	Market Price	Cost
Starting Values	90	$3.00	$500
February: Planting Card	+/-		
	=		
Biotech Seeds? Do you want seeds that can protect against drought and pests? If yes, add $100 to cost.			+
			=
March: Pest Card	+/-		+/-
	=		=
April: Weather Card	+/-		
	=		
Apply fertilizer? If yes, add $100 to cost and boost yield by 25.	+/-		+/-
	=		=
May: Market Card		+/-	
		=	
June: Weather Card	+/-		
	=		
July: Market Card		+/-	
		=	
August: Harvest Card			
Harvest totals			

_____ X _____ = _____ - _____ = _____
Yield   Price   Income   Cost   Profit

What did you roll? What does it mean? Find it here.

Planting Card

1. Perfect Planting - Due to rain and temperature, your crop is perfect. Add 25 to yield
2. Land Flooded - Replant your crop: add $200 to cost for new seed, then roll again for planting
3. Weather is fair - Yield does not change
4. Rain delays - Roll the dice and subtract the number x 10 from yield
5. Perfect Planting - Due to rain and temperature, your crop is perfect. Add 25 to yield
6. Weather is fair - Yield does not change

Pest Card

1. Aflatoxin - Your corn has a case of disease that there is no control for yet. Subtract 25 for yield and $0.10 from cost
2. Corn borers - Yield doesn't change if you bought biotech seed. If you did not buy biotech seed, subtract 25 from yield OR buy insect control: Add $25 to cost and subtract 10 from yield
3. No pests! - You are a lucky farmer! Yield does not change
4. Rootworm - Yield doesn't change if you bought biotech seed. If you did not buy biotech seed, subtract 25 from yield OR buy insect control: Add $25 to cost and subtract 10 from yield
5. Feral Hogs - The feral hogs found your young, tender corn. They dug up the field and you have to replant what they ate. Add $250 to cost to replant what they consumed.
6. Weeds - Subtract 25 from yield OR buy weed control and add $20 to cost and subtract 10 from yield

Weather Card

1. Sunny days ahead - Yield does not change
2. Drought - If you purchased biotech seed, reduce yield by ¼ (25%). If you did not purchase biotech seeds, reduce yield by ½ (50%).
3. Perfect weather - Due to rain and temperature, your crop is doing good. Add 50 to yield.
4. Rain and sunshine - Roll the dice and add the number x 5 to your yield
5. Weather is fair - Yield does not change
6. Too hot and dry - Roll the dice and subtract the number x 10 for yield OR if you bought biotech seed, subtract the number x 5

Market Card

1. Stable market - U.S. corn crop looks good and prices are stable. Price does not change
2. Feedlot downsizes - A local feedlot downsizes because the cost of cattle fell. Less cattle eating corn means the price of corn goes down. Subtract $0.10 from price
3. Drought - U.S. corn supply is significantly reduced. Add $2.00 to price
4. Bumper crop - Argentina and Brazil have a huge crop, raising the world supply of corn. Subtract $0.25 from price
5. Chicken farms move in - Two chicken farms in your area are now raising 500,000 chickens, which eat a lot of corn. Add $0.75 to price
6. China buys corn - China is eating more meat and needs more corn to feed livestock. Add $0.50 to price

Harvest Card

1. No. 2 Corn - Nice job. You provided a good crop of corn. Price does not change
2. No. 1 Corn - Your corn looks great and you receive a premium. Add $0.05 to price
3. No. 2 Corn - Nice job. You provided a good crop of corn. Price does not change
4. No. 3 Corn - Your corn has a lot of foreign material and broken kernels. Subtract $0.05 from price
5. No. 2 Corn - Nice job. You provided a good crop of corn. Price does not change
6. No. 1 Corn - Your corn looks great and you receive a premium. Add $0.05 to price