A Program of The Actuarial Foundation

Modeling the Future Challenge

MTFC Scenario Quest

MTFC 2025-26 Scenario Phase

STUDENT PROMPTS

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Modeling the Future Challenge

Welcome to the 2025-26 Modeling the Future Challenge Scenario Quest!

This document contains the materials and prompts teams need in order to complete the Phase 1: Scenario Quest submission of the 2025-26 Modeling the Future Challenge (MTFC). The Scenario Quest is structured with the 5 steps of Actuarial Process and is designed to prepare and equip teams with resources and skills that will allow them to not only successfully qualify for Phase 2: Projects, but to also successfully complete their MTFC risk-modeling project. The Scenario Quest is self-contained and requires NO outside research to complete.

Scenario Quest Scoring

Each problem #1-30 is scored on a 2-point scale based on thorough completeness.

Scenario Quest: 60 Points				
Step 1 (#1-3) 3 questions	Step 2 (#4-15) 12 questions	Step 3 (#16-22) 7 questions	Step 4 (#23-26) 4 questions	Step 5 (#27-30) 4 questions
6 points	24 points	14 points	8 points	8 points

All Scenario Phase Submissions

There are **THREE** total submission items for Phase 1: Scenarios in the MTFC that are used to determine advancement to Phase 2: Project Phase of the MTFC. See the ICS Dashboard for submission spots and templates.

- **This task: Scenario Quest Response** (1 Scenario Quest completed for the entire team; *Topic: Corn* Farming)
- **Project Proposal** (1 Project Proposal completed for the entire team; *Topic: Team Choice*)
- **Participation Waiver** (1 waiver completed for **each** team member & their coach)

Scenario Quest Submission Instructions

- The responses to the Scenario Quest prompts should be clearly numbered, organized in order, and compiled into a single file to be submitted on the ICS Dashboard.
- A template document for submissions can be found on the ICS Dashboard. Its use is not required but is an additional resource for teams who choose to use it.

All Scenario Phase Submissions Deadline:

Monday, December 8, 2025 Noon Pacific

(Note the mid-day deadline, plan accordingly!)

Support for MTFC Teams

- The Challenge staff are readily available via email: challenge@mtfchallenge.org
- The Actuarial Process Guide (APG) contains general background information on the Actuarial Process and should be consulted as a resource during the Scenario Phase. Additional resources can be found on the MTFC Resource Library: mtfchallenge.org/resources
- Join us for the Live Virtual Scenario Workshop by registering here: mtfchallenge.org/all-events

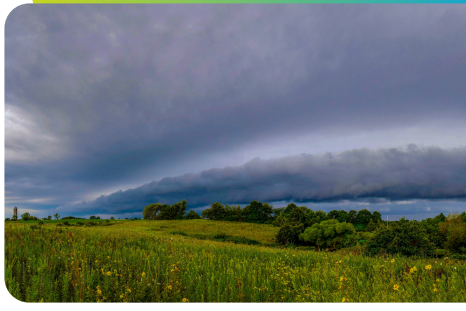
Scenario Quest Background: Corn Farming

Farmers are facing increasing risks to their crops with shifting and extreme weather conditions.

In Iowa, 99% of the corn planted is known as field corn (or "dent corn") and is a corn variety that is used primarily for livestock feed, ethanol production, and other industrial uses. Some corn is still used in the production of corn cereal, corn starch, corn oil, corn syrup and other products meant for human consumption (Source: Iowa Corn). Unlike sweet corn, most field corn is not harvested until it is dry to avoid mold and spoilage problems (or it is an extra–and costly–step to dry the harvested corn).

Farmers in Iowa face risks such as unpredictable weather patterns, with increased temperatures and drought on one end of the spectrum, while heavy precipitation events or erratic freeze-thaw cycles can damage crops and disrupt planting schedules on the other end. Farmers also face long-term risks of soil erosion, water quality degradation from runoff fertilizers, and reduced biodiversity with intensive monoculture cropping. Pests and diseases are an additional age-old risk to a farmer's crops. Corn is particularly susceptible to northern and western corn rootworms, European corn borer, fungal diseases such as gray leaf spot, northern corn leaf blight, and a variety of ear and stalk rots. Farmers also face economic risks with increasing input costs for fertilizers, seed, fuel, land, labor, and farming equipment costs, as well as market volatility and fluctuating pricing on the commodity market for the harvested corn due to global demand, trade and tariff policies impacting revenue projections. Many farmers rely on credit for operational needs and can experience financial strain with high interest rates or repayment schedules. In short, farming is a risky business, but actuarial science and risk management can help.

In any given year, it is possible that some farmers operate at a loss (negative net income). To mitigate the risks of disrupting the food and industrial supply chain and provide stability to markets (avoiding greater losses in subsequent years if a farmer decides to stop planting or harvesting), the U.S. government has a variety of programs to offer assistance to farmers, including subsidies and crop insurance. The Federal Crop Insurance Corporation (FCIC) helps the American agricultural industry by providing insurance policies to farmers across the country. These policies protect farmers against severe crop losses due to flood, drought, pests, disease, severe storms and other factors that could cause a loss to the value of the farm.



Your Scenario Quest Mission

You are an actuarial consultant who has been hired by an Iowan farmer, Farmer Jones. The farmer has inherited a family farm (not part of a conglomerate or commercial farm) and needs to make informed decisions on how to mitigate the risks of farming within her region as she plans for the coming season.

In this scenario we examine information from Smith County, Iowa. The data used in this scenario is based on real data from the USDA's Risk Management Agency, however the name of the county has been changed.

The former owner was a poor bookkeeper and didn't have good records to share with Farmer Jones (hence the need to use data for all farmers in Smith County), but has previously been a continuous corn cropper. Farmer Jones' farm consists of 345 acres that will be planted for corn. Since Farmer Jones owns her land, she does not incur additional costs of leasing or renting her farmland.

Jones plans to use a farm model of continuous corn cropping ("corn following corn"), which means that another crop (such as soybeans) is not planted in the same field between corn harvests (known as "crop rotation"). While continuous cropping can result in reduced yields due to soil nutrient depletion (resulting in higher input costs for fertilizer, particularly nitrogen), the high demand for corn silage can add stability for Farmer Jones as it can simplify her farm management strategy, particularly with strong market prices and demand for corn silage. For dent corn in Iowa, farmers can begin early harvesting as early as September while the majority of the dent corn is not harvested until October. Late harvesting can continue into November depending on cool and dry weather conditions if a farmer is waiting for the corn to dry further.

Most farmers sell their dent corn harvest in the fall (October-December) at the current market price. If a farmer has the storage capacity and can handle the risk for spoilage, they can choose to sell through commodity futures contracts (e.g., selling their December corn for delivery the following May at the future May price) or wait and watch the commodity prices to choose when to sell throughout the winter or following spring. Much of the decision of when to sell depends on the farm's capacity, cash flow needs, weather, and market conditions.

Farmer Jones has requested that you help her analyze the projected current trajectory of her farm and the risks she should plan to address, as well as potential risk mitigation measures she can implement in order to be a successful long-term corn farmer.

Assumptions in this scenario include:

- The term "farmer" and "producer" indicate the same person.
- Each farmer reported in the dataset holds and pays a premium on just 1 crop insurance policy annually.
- Inflation rates from 1994-2025 are disregarded.
- The number of farmers in Smith County is considered to be constant 1994-2025.
- Farmer Jones' 345 acre farm is the average-sized corn farm in Smith County, Iowa.
- The descriptions of the FCIC crop insurance policy and payout process have been simplified for this scenario; computations for this scenario should be computed following the instructions and formulas as outlined in the scenario prompts.

The Scenario Quest Dataset

Note: This Scenario Quest includes an attached dataset. It is self-contained and no additional or outside data is needed to be able to respond to and complete the Scenario Quest prompts.

There are three tabs in the attached dataset. A description for each tab and column are outlined below.

Tab: Cause of Loss Smith County

This includes insurance claims for corn loss in Smith County, Iowa (1994-2024) from the FCIC.

- **Year:** The year that the insurance claim was made
- **Commodity:** All claims included are for corn only
- **Insurance Plan Name Abbreviation:** RP: Revenue Protection, RPHPE: Revenue Protection with Harvest Price Exclusion, YP: Yield Protection, ECO-prefix: Enhanced Coverage Option (ECO) when combined with a plan, MP-HPO: Margin Protection with Harvest Price Option, ARP: Area Risk Protection, SCO-prefix: Supplemental Coverage Option when combined with a plan, AYP: Area Yield Protection, GRIP-HRO: Group Risk Income Protection - Harvest Revenue Option
- **Stage Code:** The stage of plant development at the time of the loss
- **Cause of Loss:** A description of the cause of loss
- **Month of Loss:** Month when the loss occurred
- **# of Policies Paid Out** (# of policies paid out in that month with that cause of loss and stage code; note that there may be multiple months listed within each year based on the insurance plan type, stage code, and cause of loss)
- **Average premium:** The average premium paid in by the farmer
- **Average amount paid out per policy:** The average insurance payout to the farmer for a policy in that month/year/cause of loss

Tab: Corn Planting Costs

This data is for farmers in Smith County, Iowa, who plant "corn following corn" (like Farmer Jones). Data on the average cost per acre for each year, 2016-2025 for:

- Operating and maintaining farm machinery
- Seed, chemicals, etc. per acre
- Labor costs per acre
- Assumed harvest yield (bushels/acre)

Tab: Corn Harvest Prices

This data is for Smith County, Iowa. The average corn sale price per bushel for 2016-2025 for each month is given.

- **Avg Cal Yr:** The average of corn sale prices January - December of the same calendar year
- **Avg Mktg Yr**: The average of corn sale prices for the corn marketing year (September of the current year through August of the following year)
- Note: 2025 data from May onward is unavailable as that is the current year and has not yet been released.

Attached Dataset:
The accompanying dataset contains all data needed to complete the MTFC Scenario Quest.

See the "Data Description" tab for a complete outline of the data provided.

XLS

PART 1: PROJECT DEFINITION

When embarking on a risk modeling project, it is important to identify the risks of the particular topic as well as the parties who may be at risk. There are often parties who are directly impacted as well as larger communities who can be both directly or indirectly impacted by the risks. Along with identifying the risks, we have to be able to quantify the potential risks.

#1: WHO IS AT RISK?

In 3-5 sentences, describe what groups (besides Farmer Jones herself), might be at risk of loss in regards to farming corn? Identifying the scope (boundaries on size) and scale (potential severity or impact) that the risks have is important for understanding what needs to be characterized. Identify 2-3 other groups at different levels (e.g., local, state, national, and international levels) within your response who may have a loss related to corn crops.

To be able to conduct a valuable research project, we must be able to characterize the risk in quantifiable terms–we have to get down to the numbers.

#2: DEFINING THE RISKS

In 3-5 sentences, describe the risk to Farmer Jones and her farm itself. What kind of quantified values can you identify that could be valuable numerical ways of characterizing the risks of crop loss? *You may refer to the available datasets and prompts for ideas, but also consider what kind of data or numbers you would think would be the most helpful (even if that data does not exist in the provided datasets–sometimes you have to dream about what data you would like to find to drive you to fruitful data searches in your own project).*

The goal of a Modeling the Future Challenge project is to make recommendations on how to best mitigate or manage the risks your team has identified. In the Actuarial Process Guide, we define three types of risk mitigation strategies (see page 14 of the Actuarial Process Guide for more information):

(1) Behavior Change (reducing the likelihood or frequency that the undesirable event happens),
(2) Modifying Outcomes (reducing the severity of the impact if the undesirable event happens),
(3) Insurance (reducing the uncertainty of impact of the loss given that the undesirable event happened).

#3: IDENTIFY RISK MITIGATION STRATEGIES

In 3-5 sentences, identify a risk mitigation strategy that Farmer Jones may choose to mitigate risk for her farm in each of the three categories and describe how you think each of these three strategies might be able to help mitigate those losses. Is there a strategy category that seems to be more or less feasible than another category to pursue? No calculations needed.

PART 2: DATA IDENTIFICATION & ASSESSMENT

The dataset provided for this scenario includes everything needed to be able to address the prompts in this Scenario Quest. For your own topic, you will need to identify your own data and evaluate whether the data you have identified will enable a good data analysis.

On page 18 of the Actuarial Process Guide, three categories or types of data are identified that may be valuable in analyzing risks and making recommendations on mitigation strategies.

- ***Data Category #1 Characterize/refine categories of potential outcomes.*** The data should allow you to see historical relationships and identify some groups based on characteristics of interest and categories of outcomes.
- ***Data Category #2 Define severity or range of loss of potential outcomes.*** The data should enable you to find insight into what kind of losses (particularly financial) have been incurred historically for the different groupings identified. Identifying trends and the boundaries (range) frames loss expectations.
- ***Data Category #3 Define frequency or likelihood of potential outcomes.*** The data should allow you to see how often certain outcomes occurred in the past. Ideally, multiple years, seasons, or other relevant timeframes should be represented to identify trends and likelihood of future occurrences.

#4: IDENTIFYING THE TYPE OF DATA

In 2-3 sentences each, identify which of the three categories of data identified in the Actuarial Process Guide are provided in each of the tabs of the scenario's attached dataset. Be specific in identifying the column (or description) from the dataset or the scenario description in your response. Explain (at a high level) what information and insights these datasets can provide.

- Cause of Loss Smith Co tab
- Corn Planting Costs tab
- Corn Harvest Costs tab

DATA SUMMARIES: USE THE CORN PLANTING COSTS TAB TO ANSWER #5–8:

Since Farmer Jones does not have recent records for her farm's corn production history, she can use the historic data for Smith County's corn-following-corn production data.

#5: PLANTING COSTS FOR FARMER JONES

What is the average total cost per acre for corn production (2016-2025) and average total cost per bushel (2016-2025)?

#6: ASSUMED YIELD FOR FARMER JONES

What is the average assumed yield (bushels per acre) for 2016-2025?

PART 2, CONTINUED...

The costs for planting set the break-even point that Farmer Jones needs to recover from sale of the crops after harvest (and thus outlines the levels for the severity of loss in the case of a total or partial loss).

#7: ANTICIPATED TOTAL PLANTING COSTS

For Farmer Jones, if all 345 of her farm's acres are planted, using the average cost per acre found above in #5, what is the anticipated total cost for planting in the next season?

#8: RANGE FOR ANTICIPATED COSTS

Critical Thinking: Realistically, is this value found in #7 higher, lower, or "about right" for the actual anticipated costs? What might be a realistic "range" (i.e., reasonable minimum and maximum values for the planting costs)? Why? Explain in 1-2 sentences (additional computations are optional).

The harvest expectations will project the anticipated revenue that Farmer Jones can anticipate from the sale of her corn crops.

#9: HARVEST EXPECTATIONS FOR FARMER JONES

For Farmer Jones, if all 345 acres of her farm are harvested with the average yield found above in #6, what is the projected total yield (in bushels)?

DATA SUMMARIES: USE THE CORN HARVEST PRICES TAB TO ANSWER #10–13:

#10: CORN SALE PRICES EXPECTATIONS

Find the average cash corn prices for each individual month (Jan - Dec) for 2016-2025 and note them in a table (shown below).

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

#11: TRENDS IN CORN PRICES

Identify 2-3 trend(s) that you notice regarding cash corn prices (i.e., over the years, within a calendar year, or within a marketing year) in the Corn Harvest Prices tab that may impact when a farmer wishes to sell their crop. Explain why you believe the trend is noteworthy or why it occurs in 1-2 sentences each (no new computations required).

PART 2, CONTINUED...

The projected revenue is not static as the market price varies between years and even between months within the year. Thus, Farmer Jones needs to be strategic as she plans for the sale of her crops as the greatest market price allows her to plan better for future years and make strategic improvements to her farm with surplus funds or fund the next season without relying on additional credit.

#12: HARVEST EXPECTATIONS WITH OCTOBER SALE

> If Farmer Jones harvests and sells her entire harvest (found in #9) using the 2016-2025 average corn sale price for October (as found above in #10), what would her revenue be? What would her profit be (using planting costs found in #7)?

#13: HARVEST EXPECTATIONS WITH OPTIMAL SALE

> If Farmer Jones is able to store her harvested corn and wait for the optimal sale, (using the 2016-2025 averages found in #10), what could she anticipate for a maximum revenue? Identify the month and revenue amount.

There are many risks that a farm faces and unfortunately, risks are exactly that: undesirable events that may or may not actually occur. Some years may have perfect weather conditions and high yields. Other years may have difficult or even catastrophic weather or pest conditions that affect some or all of the crop. Still other years may have economic or financial factors globally that are not only outside of the farmer's control, but outside of their local network to mitigate, too. Unfortunately, the farmer does not have unlimited resources to be able to plan for every risk or cause of loss that has ever occurred and thus must narrow in on the uncertainty associated with risks in order to be able to make informed decisions on how to approach risk mitigation.

The dataset includes a "Cause of Loss" tab, which summarizes the 7,288 claims that were paid out that were made by farmers who had crop insurance in Smith County, Iowa, from 1994-2024.

DATA SUMMARIES: USE THE USE THE CAUSE OF LOSS TAB TO ANSWER #14–16

#14: CREATION OF A DATA VISUAL.

> Create a chart (e.g., pie chart, bar chart, etc.) that summarizes, labels, and categorizes the causes of loss for claims for 1994-2024. Include the chart in your response.

#15: TOP CAUSES OF LOSS & THEIR IMPACTS

> - Based on the data visual you created, what appear to be the top 3 leading causes for a loss claim? Why? Explain in 1-2 sentences (include the frequency of these claims in your response).
> - How does this information on the top 3 causes of loss inform Farmer Jones as she plans for future risks to her farm in Smith County? Explain in 2-3 sentences.

PART 3: MATHEMATICAL MODELING

Building math models can involve programming and complex systems, but math models often start by identifying trends and/or projections (some of which may–or may not–be useful). You may select a model to start and discover that a different model is needed. Math models also require assumptions to simplify complex real-world problems (due to multiple variables, data availability, etc.). Computing values that will enable you to conduct a valid risk analysis is one of the primary functions of your math model. The questions below do not develop a full mathematical model like you will in your own project in the Project Phase, but they give a taste of the type of questions you (may) consider in your own model's development.

USE THE USE THE CAUSE OF LOSS TAB TO ANSWER #16 & 17

#16: LINEAR REGRESSION

Conduct a linear regression on the frequency of loss claims for the top 3 cause of loss claims identified in prompt #15 for 1994-2024. Provide the plot (plot all 3 on the same chart), regression equations, and correlation coefficients in your response.

#17: CAUSE OF LOSS TRENDS OR PATTERNS

Referring to your regression conducted above in #16, describe 2-3 trends or patterns you observe in causes of loss over the historical timeframe (e.g., maximums, minimums, patterns, co-occurrence of causes of loss, etc.). Offer a short plausible explanation for why you believe the trend occurs (1-2 sentences each).

For your own MTFC Project Topic and Proposal, you will need to develop and evaluate assumptions that simplify the complexities of the real-world situation that will enable you to develop the conditions under which your mathematical model is valid. Refer to the APG for more information on assumption development.

#18: ASSUMPTION EVALUATION

In 1-2 sentences, evaluate and assess the reasonableness and rational basis for the assumption below. Note why the assumption is necessary or reasonable to simplify the topic in order to model or if the assumption goes beyond what is reasonable.

Assumption: "Nationally, approximately 91% of farm producers have farm insurance. We assume that the rate of farm producers who have farm insurance is the same for Smith County, Iowa."

#19: ASSUMPTION DEVELOPMENT

Write your own 1-2 sentence assumption that would pertain to this real-world scenario for math model creation (it may be an assumption about the scenario's data, problem statement, possible outcomes, math model structure, or other pertinent factor). Provide a 1-2 sentence justification explanation as to why the assumption is needed and reasonable.

See the 1-page Resource on Assumption Development in Step 3: Math Modeling in the MTFC Resource Library for more details and examples on Assumption Development.

PART 3, CONTINUED...

Farmer Jones has several risks identified that she needs to account for in future years (as identified in the prompts above). Given limited time and funding that prevent her from unilaterally addressing every risk to her farm, Farmer Jones has decided to focus on mitigating the risk due to drought.

EXPECTED VALUE

While helpful, the Cause of Loss data tab alone is not the full picture of Smith County as it only includes data on the number of policies that actually incurred claims and payouts from the FCIC. Farmer Jones faces uncertainty as to the likelihood and severity of the risks to her crop that she faces and can be helped by identifying the expected value (EV) of loss:

EV = (frequency of the loss) x (severity of the loss).

There are currently **2,936 producers** (i.e. "farmers") in Smith County, Iowa. **Nationally, approximately 91% of producers have farm insurance; we assume that farmers in Smith County have insurance at the same rate.**

#20: FREQUENCY OF CLAIMS DUE TO DROUGHT

> From the Cause of Loss tab (1994-2024), what is the annual average frequency of claims made for drought for farmers in Smith County, Iowa?

#21: EXPECTED VALUE OF LOSS DUE TO DROUGHT

> For Farmer Jones, what is the expected value of crop loss due to drought in a given year (based only on the actual cost for Farmer Jones to plant)? Refer to the planting costs found in #7 for Farmer Jones' severity of loss.
>
> *For more information on expected value, see the 1-page Resource on Expected Value in Step 3: Math Modeling of the MTFC Resource Library.*

#22: AVERAGE ANNUAL INSURANCE PAYOUT DUE TO DROUGHT

> What is the average annual insurance payout per policy for farmers in Smith County due to drought (use the Cause of Loss tab)? What could this mean for Farmer Jones as she considers her risks due to drought? Explain in 2-3 sentences.

PART 4: RISK ANALYSIS

In your own MTFC Project, you'll need to conduct a risk analysis that will help guide you to making effective recommendations on a strategy (or strategies) to mitigate the identified risks. For more information, see the 1-page Resource on Risk Analysis Objectives in Step 4: Risk Analysis of the MTFC Resource Library. In your own risk analysis, you need to address why you did (or did not) pursue other strategies, so not every strategy you consider is guaranteed to become a recommendation for mitigation. Your risk analysis should characterize the baseline ("business as usual") scenario of the current trajectory of the situation as well as a characterization of the projected impact that a risk mitigation strategy could have on the scenario. The outputs of your math model should inform the characterization of the current trajectory and/or the mitigation considerations.

#23: RISK MITIGATION STRATEGY: GRAIN SILO

Farmer Jones is considering purchasing and installing a grain silo to store harvested corn for long periods of time. She is considering a 100,000 bushel grain storage silo that would cost $250,000 to purchase and install (labor included).

- What risk(s) might Farmer Jones mitigate by installing a grain silo? What kind of risk mitigation strategy is this (behavior change, modifying the outcomes, insurance)? Explain in 1-2 sentences.
- Identify 2-3 advantages or "pros" of installing a grain silo as a risk mitigation strategy. Explain and justify your response in 2-3 sentences (no new computations necessary).
- Identify 2-3 disadvantages or "cons" to installing a grain silo as a risk mitigation strategy. Explain and justify your response in 2-3 sentences (no new computations necessary).

#24: RISK MITIGATION STRATEGY: IRRIGATION SYSTEM

Based on the fact that drought seems to be a major cause of loss, Farmer Jones is exploring the option to install an irrigation system for her entire farm. Details for the system she is exploring are included below. For this scenario, we assume that she has ample groundwater access for the pumps and does not have to purchase water access rights.

- **Installation Cost:** The system would require pumps and permanent piping, which is anticipated to be $1,500 per acre for labor and materials.
- **Usage Cost:** Once installed, per-acre pumping costs are projected to be $58 per acre for energy usage for the season and an additional $30 per acre per season for maintenance and repairs.
- **Projected impact:** Based on conversations with neighboring farmers who have installed irrigation systems on their corn farms also in Smith county, it is projected that Farmer Jones could anticipate a yield of 270 bushels of corn per acre by using the irrigation system.

Questions:

- Identify the installation costs and annual operating costs of the irrigation system for Farmer Jones' farm.
- What is the anticipated annual corn harvest yield (in bushels) with the irrigation system?
- If Farmer Jones were to sell her entire crop upon harvesting in October, what is the anticipated revenue for this anticipated harvest with the irrigation system (use the 2016-2025 average corn sale price for October as found above in #10)?

PART 4, CONTINUED...

RISK MITIGATION STRATEGY: CROP INSURANCE

Note: The description and guidelines for Revenue Protection crop insurance has been simplified from the official FCIC description for the sake of this scenario. All computations should be done using the formulas and descriptions provided in this scenario.

The U.S. Department of Agriculture's Risk Management Agency offers a variety of insurance plans available for specific commodities, including corn. Farmer Jones is considering purchasing a Revenue Protection crop insurance policy. This type of policy would provide a guarantee against the undesirable outcome in which anticipated crop yields are lower than projected (due to natural causes) as well as a guarantee against the undesirable outcome in which the sale price at harvest is lower than projected sale price when the policy was purchased earlier in the year (thus protecting against a drop in revenue). Several types of insurance policies exist and the premium (payments that the farmer would need to make to the insurance company) would be cheaper or more expensive depending on what is included in the coverage of the policy.

Equations

- **Guarantee per acre** = (projected yield) x (coverage percentage) x (higher of projected or harvest price)
- **Actual Revenue per acre** = (actual yield) x harvest price
- **Insurance Payout** (only triggered if the guarantee is greater than the actual) = guarantee per acre – actual revenue per acre

Conditions Farmer Jones is considering for a scenario outlining a decline in price:

- Farmer Jones is considering a policy with 85% coverage that has a premium cost of $25 per acre.
- For the scenario that Farmer Jones is considering:
  - the approved yield is the same as the actual yield (computed by you in #6),
  - the agreed-upon projected price is $5.20 per bushel of corn, and
  - at harvest, the actual price was $4.39 per bushel of corn.

#25: CHARACTERIZING THE CROP INSURANCE SCENARIO

Using the equations and conditions outlined above:

- Find the revenue "guarantee per acre" with 85% coverage.
- Find the "actual revenue per acre."
- Use the values found above. If the insurance payout is triggered, compute the insurance payout per acre and total insurance payout. If the insurance payment is not triggered, explain why not (in 1-2 sentences).

#26: VALUE OF THE INSURANCE POLICY

While Revenue Protection can address the risk of lower yields than anticipated, Farmer Jones is specifically interested in exploring how Revenue Protection can be used to mitigate the risk of a drop in price (if she was only interested in mitigating risk of lower yields, she could purchase the cheaper Yield Protection insurance).

- Identify the total cost of the annual premium for Farmer Jones' farm for the Revenue Protection plan outlined above.
- Based on the analysis conducted here on Revenue Protection, would you recommend that Farmer Jones purchase revenue protection crop insurance to protect against a drop in price or potentially rely on Yield Protection insurance only? Why or why not? Explain in 2-3 sentences (additional computations optional).

PART 5: RECOMMENDATIONS

Ultimately, the goal in a risk modeling project is to make a decision and recommendation on whether or not a potential risk mitigation strategy should be adopted. The risk analysis conducted in the previous section on the outcome after implementing a risk mitigation strategy needs to be evaluated on whether the strategy actually has positive impact and whether the costs or additional risks of implementation are effective or warranted given the potential impact, risk reduction, and costs. In your own scenario you may end up making more than one recommendation based on the outcomes of your risk analysis. In the following two prompts, you will assess the impacts and difference between the "business as usual" characterization of the risks without any risk mitigation with Farmer Jones' farm and the projected impact that a risk mitigation strategy would have on the situation.

FOR THE FOLLOWING PROMPTS, THE IRRIGATION SYSTEM STRATEGY OUTLINED IN THE RISK ANALYSIS SECTION IS CONSIDERED.

#27: IRRIGATION SYSTEM IMPACT

Based on the data available to Farmer Jones, other corn farmers in Smith County who have installed an irrigation system like the one she is considering have found that their chance of loss due to drought has dropped to 0.2% in any given year.

If Farmer Jones installs the irrigation system as outlined in Prompt #24 above, what is her expected value of loss due to drought (with severity of loss being the cost of planting found in #7)?

#28: COMPARISON OF EXPECTED VALUE OF LOSS

Compare the expected value of loss with the irrigation mitigation strategy (what you just found in #27 above) to the expected value of loss without mitigation measures that you computed in #21. Is this expected value of loss a noteworthy improvement or not? Explain in 1-2 sentences and justify your answer with relevant supporting computations.

#29: PROFIT TRAJECTORY WITH IRRIGATION

What is the anticipated profit for the first year after utilizing the described irrigation system (assuming the planting costs as found in #7)? What implication does this have for a timeframe projection of profitability with an irrigation system? Explain and justify your response in 3-5 sentences with any supporting computations necessary.

#30: SHOULD THE IRRIGATION SYSTEM BE RECOMMENDED?

Identify 1-2 advantages or compelling reasons to install the irrigation system and 1-2 drawbacks or possible consequences of installing the irrigation system.

Based on your analysis, would you recommend that Farmer Jones invest in the irrigation system for her farm? Why or why not? Explain in 3-5 sentences and justify with any relevant computations and values.