Farming: Competition and Collaboration

Day 1

SETTING:

You are 4 neighboring farmers in the central valley of California. Each of you owns 200 acres of farmland, and needs to decide what to plant to maximize your profit at harvest time.

The climate here is suitable for the following 4 crops. Their value per acre is shown in the table below. You can plant any number of acres with any combination of these crops.

Crop	Can be harvested in:	Represented by Q-tip	Cost to plant & grow:	Crop Market Value:
Pistachios	10 years	Green	$ 2,200/ acre	$ 4,500/ acre
Almonds	8 years	Red	$ 4,000 / acre	$ 6,800/ acre
Walnuts	5 years	White	$ 2,200 / acre	$ 7,200/ acre
Grapes	3 years	Purple	$ 3,300 / acre	$ 4,800/ acre
Fallow – this is land that is not planted. Farmers are still legally required to maintain the land clean and weed--free.		No crops planted	$ 500 / acre	$ 0/ acre

CHALLENGE: Make a planting strategy for your 200 acres to maximize your returns at harvest time.

MARKET RULES: Since the market value of any crop is related to the economics of supply and demand, the following market rules apply:

(1) REDUCED SUPPLY: If less than 16 total acres of any crop is grown, its market value triples.

(2) CORNER ON THE MARKET: If you are the only person selling a crop, it doubles in value.

(3) INCREASED SUPPLY: If everyone sells the same crop, its value decreases by one half.

(4) MARKET FLOOD: If more than 600 acres of one crop is grown in total, its market value drops to one fourth of the original value.

You have the option to collaborate with your neighbors, or just wait until planting time to see what happens. Once plans are submitted, and planting begins, no one can make any changes to their plantings.

PLANTING STRATEGY:

Fill out the table below with your finalized plan.

Make sure that your anticipated total income exceeds your total costs, or your farm will go bankrupt!

Crop	Number of Acres planted	Cost[1]	Anticipated Income[2]	Anticipated Profit [3]
Pistachios				
Almonds				
Walnuts				
Grapes				
Fallow				
Total	160			

Formulas: [1] Acres planted x cost per acre
[2] Acres x value per acre

[3] Anticipated income per acre – cost per acre

RATIONALE: Explain your strategy to maximize your profits.

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PLANTING:

Once everyone has submitted their planting strategies, it is time to plant.

1. **Prepare the soil**: Fill your baking sheet with a thin layer of clay, about ¼ in thick. Make sure it is even throughout your property, or your crops may not grow well.

2. **Purchase your seedlings**: From the bank, get the correct number of Q--tips to match your planting strategy. Each Q--tip of a color represents 1 acre planted in that crop.

3. **Plant your seedlings**: Firmly press the Q--tips into the clay in even rows. Organization is essential for equal watering, fertilizing and harvesting. Clearly mark any fallow acres.
4. **Label your farm!** Using a popsicle stick, make a sign with your name on it to identify your farm.

5. **Leave it to grow**. Come back next time and see what has happened

Day 2: BREAKING NEWS

After several years of drought, the snowfall on the Sierra Nevada Mountains has been extraordinarily high this winter. Extremely high temperatures this summer mean that all the snow is melting very fast. As it flows into the valley, there is a very high probability that it will flood your fields and ruin your crops.

In about[1] 20 minutes, ½ cup of water will be poured into the central valley, where it as the potential to ruin any or all of your crops. If a Q--tip gets wet, the crop is ruined, and you will get $0 from that acre of land at harvest time, even though you already spent the money on it.

CHALLENGE: Make a plan to help your farm best survive the incoming flood.

POINTS TO CONSIDER:

1. OVERALL PROFIT: Remember, your goal is to help your farm stay financially stable. How can you ensure that your farm does not go bankrupt, and makes at least some profit? Remember, market rules still apply, and will be calculated at the end of the growing season.

2. RESOURCES: Your best resource here is the soil (clay). If you modify it in strategic ways, you may be able to construct structures to mitigate flood damage.
    - What will you build? How many? How big?
    - Where in the central valley will you build them?

3. COSTS: Construction is expensive. Someone will have to pay for laborers and equipment. Any farmer who participates in a construction project will be charged:
    - $100 for breaking ground
    - $100 for reaching the bedrock (bottom of the pan)
    - $100 for each minute spent actively building
    - Additionally, any crops that are pulled up from the ground in the construction process are ruined and you will earn $0 for them. Once a crop is pulled up, it **cannot** be replanted.

4. COLLABORATION: Every farm is looking to its own best interest, but your actions influence each other's success.
    - Who will pay for construction costs? What can you do to sweeten the deal for your neighbors? Do some crops need to be sacrificed? Whose? Why?

Talk to your neighbors, make a plan, and implement!

[1] Meteorology is never an exact science

Flood Damage Control Plan	
Write a brief description of your flood control plan. Include **what** you are building and **where.**	What are the financial implications for each farmer? How much do they each anticipate to gain or lose? Farmer #1: Farmer #2: Farmer #3: Farmer #4:
Rationale: Why do you think this is the best plan? Briefly explain your thinking.	

IMPACTS OF THE FLOOD

The flood has finally come. Record the impacts on your farm below.

Impacts on Crops		
Crop	Acres lost (either from water damage or flood mitigation plan)	Total monetary value lost in crop damage
Pistachios		
Almonds		
Walnuts		
Grapes		
Fallow		

Other impacts		
	Compensation you paid to other farmers	Compensation you received
Compensations		

Total construction costs

you paid

DISCUSS:

(1) How successful was your flood control plan? Why?

(2) Compare the success of your neighborhood of farms to that of other groups. What did they do differently? What would you have done differently if you could?

EXTEND: Take a moment to brainstorm other events (besides a flood) that could occur and impact farmers' success, either positively or negatively.

HARVEST TIME!

At long last, harvest time has come! Fill out the table below with your final bookkeeping.

Expenses				
	From crops		**Other expenses**	
Crops planted	Acres of crop planted	Cost per acre planted	Source	Amount
Pistachios			Construction costs	
Almonds			Compensation costs	
Walnuts			Other	
Grapes				
Fallow				

Expenses	

	From crops		**Other income**	
Crops planted	Acres of crop harvested	Cost per acre harvested	Source	Amount
Pistachios				
Almonds				
Walnuts				
Grapes				
Total				

Total Income	- Total Expenses	= Profit

REFLECTIONS:

1) How did the natural resources available to you and hazards that occurred influence your success as a farmer? Another way to consider the same question is to think about how your success might have been different if the soil, climate, or water conditions had been different.

2) How do scenarios like this affect the sustainability of human populations? As the global human population increases, what impact do you think that will have on farmers?

3) What contributed to your success? Luck? Planning? Relationships with other farmers? Something else?

4) How realistic was this experience? Why?

5) How did this experience impact the way you understand agriculture?