

Name: _____

Date: _____

Palm Farm Design Task

Part 1: Define the Problem

Problem: Oil palm is a plant that provides a key ingredient for foods and cosmetics. Oil palm uses less land to grow compared with other crops, but it grows in the same places as rainforests. Oil palm is a valuable crop that provides farmers in Indonesia with a steady income with which to support their families. When farmers clear land to plant oil palm, they sometimes cut down rainforests. This is related to orangutan populations going down.

Revise the goal for a better oil palm farm:

Part 2: Revise the Criteria and Constraints

Criteria: standards that must be met by the design of the farm. (How will we know it works?)

- 1.
- 2.
- 3.
- 4.

Constraint: a limitation to what can be designed. (What can we do or not do?)

- 1.
- 2.
- 3.

Part 3: Choose Crops to Grow

Use this planning template to help you decide which crops to grow on your new oil palm farm.

Year 0 is when you plant your crops. Year 0-5 means from when you plant to the 5th year that you grow and harvest the crops.

KEY

☐ growing

☐ harvesting

| | Years to grow and harvest crops | | | | | | | | | |
|--|---------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 0-5 | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 |
| Oil Palm (OP) | | | | | | | | | | |
| Teak (T) | | | | | | | | | | |
| Cocoa (CC) | | | | | | | | | | |
| Coffee (CF) | | | | | | | | | | |
| Latex (L) | | | | | | | | | | |
| Which crops can you sell during this time? | | | | | | | | | | |

Part 4: Decide How to Plant Your Crops to Provide Stable Income

After using the Crop Calculator Tool, record your best design for a farm. Record the % of land you will use for each crop and the lowest, highest, and average income you will receive.

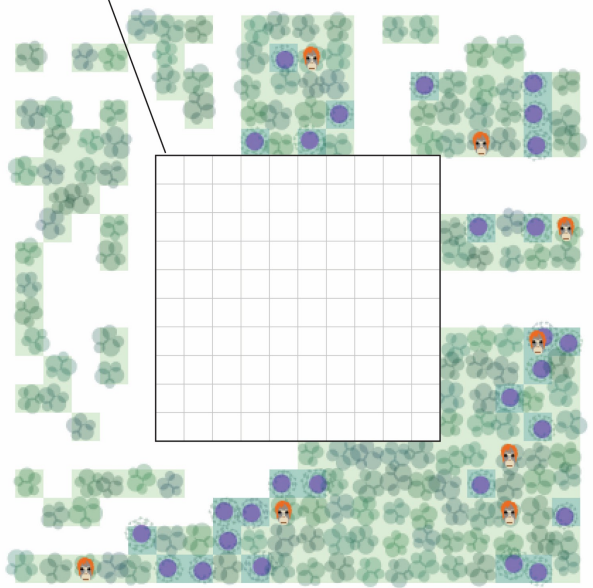
| Crop | % land | Why it works | Lowest income: |
|------|--------|--------------|--------------------------|
| | | | _____ |
| | | | Highest income: |
| | | | _____ |
| | | | Average per year income: |
| | | | _____ |

Part 5: Reflect on How Your Design Meets/Does Not Meet the Criteria for Farmers

An important goal for the palm farm design is to support farmers. Write an explanation, supported by evidence, for how your crop selection will financially support a farmer.

Part 6: Plan and test your farm design

Below is a farm plot from the simulation. Use a colored pencil to shade in 20% of the farm in a way that you think would benefit orangutans. Then test your design by running 5 trials in the simulation. Record the lowest, highest, and average values. Then calculate the average population for your design.

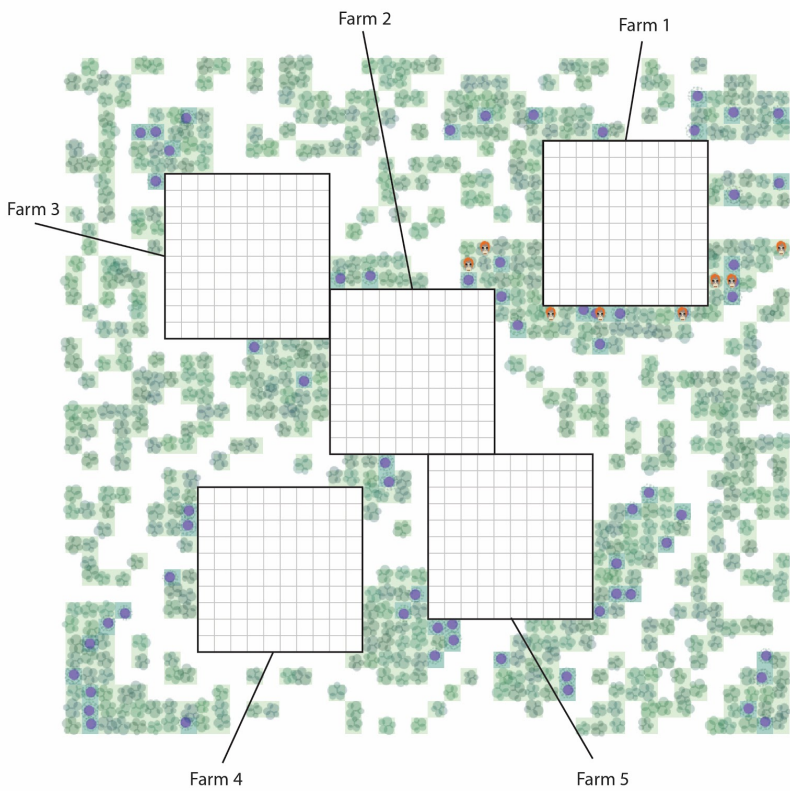
| Design | Your Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---------|----------------------|--|--|--|--------|---------|---------|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|
| <div><p>Your farm</p></div> | <div>The 50 years that you own your farm = 2600 weeks</div> <table><thead><tr><th></th><th colspan="3">Number of Orangutans</th></tr><tr><th></th><th>Lowest</th><th>Average</th><th>Highest</th></tr></thead><tbody><tr><td>Trial 1</td><td></td><td></td><td></td></tr><tr><td>Trial 2</td><td></td><td></td><td></td></tr><tr><td>Trial 3</td><td></td><td></td><td></td></tr><tr><td>Trial 4</td><td></td><td></td><td></td></tr><tr><td>Trial 5</td><td></td><td></td><td></td></tr><tr><td>Average</td><td></td><td></td><td></td></tr></tbody></table> | | Number of Orangutans | | | | Lowest | Average | Highest | Trial 1 | | | | Trial 2 | | | | Trial 3 | | | | Trial 4 | | | | Trial 5 | | | | Average | | | |
| | Number of Orangutans | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Lowest | Average | Highest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Average | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Analysis Questions

- What worked well in your design?
- What would you change about your design, and why would this change better support orangutans?
- What was helpful about completing multiple trials? What do you think could explain the variability in your data?

Part 7: Plan a farm with your neighbors

Work with your group to decide where to place 20% forest on each farm. Your goal is to provide a stable habitat for orangutans. Even better would be to increase the orangutan population. First, shade in a plan. Second, test your design running up to 5 trials on the design. Calculate the average population size your design supports.

| Design | | Group Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----------------------|--|---------|--|--|----------------------|--|--|--|--------|---------|---------|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|---------|--|--|--|----------------|--|--|--|
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| Trial 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | <p>Analysis Question: What worked well in your design? What would you change about your design, and why would this change better support orangutans?</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Part 8: Explain How Your Design Works for Farmers and Orangutans

| Features of your groups' farm that work | Explain why the feature works to support farmers, orangutans, or both |
|---|---|
| | |
| | |

Construct an explanation about how your individual and group farms meet the goals for the design task. Make a claim about features that worked. Support your claim with evidence from your investigations and reasoning about why the evidence supports your claim.
