

THE CASE OF THE FAILING FARM

You work for the Bucolic County Soil Conservation District. One day you are given the following letter from a worried local farmer, describing a problem that you have been assigned to research and solve.

Manager
Soil Conservation District
Bucolic County, Michigan

Dear Sir or Madam,

I hope you can help me solve a mystery. We have been experiencing some very unusual events over the past two years on our family farm. We own 80 acres of land, consisting primarily of rolling hills. The soil is mainly a sandy loam, which provides very good drainage. In the past few years, we have had the following problems:

- Productivity is decreasing.
- Bare patches of ground are appearing on the tops and sides of the hills.
- The stream is becoming wider and less deep.
- Small dust storms are occurring in July.
- Gullies are forming on the hillsides of the pastureland.

I suspect that recent weather conditions have led to these problems. Two years ago we had a very dry winter and spring. Although we irrigated the potato and cornfields that summer, the pasture was overgrazed and our hay grew poorly. The following fall, winter, and spring were very wet, so we did not need to irrigate despite a dry summer. This year, we had an abrupt warmer spell in February that melted most of the snow on our fields. Then, when the heavy rains came in the spring, the fields became a muddy mess.

Enclosed you will find a diagram of our farm. I hope you can determine the cause of our problems and advise us on how to solve them.

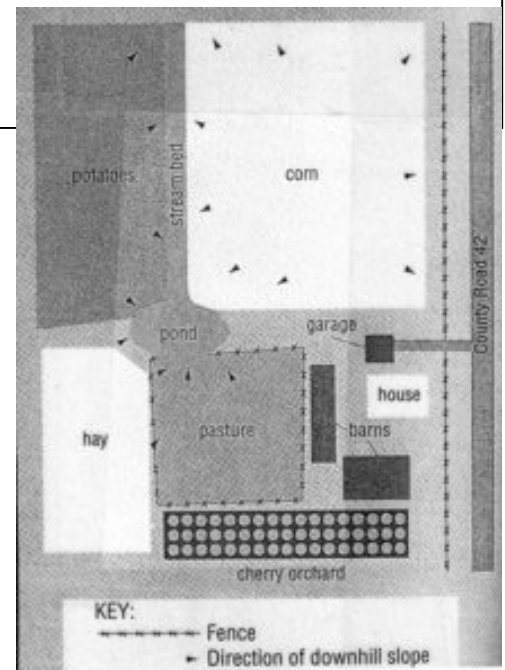
Sincerely,

Francis Katawa

Francis Katawa

As you review the information that Mr. Katawa has given you, you realize that recent weather conditions have made the land very susceptible to soil erosion. You decide to make a model of the Katawa farm to observe the effects of erosion in more detail and to study ways of reducing erosion.

1. **CONSTRUCT** a model of the Katawa farm by filling a large tray with sandy soil, building the hilltops to a height of 5-10 cm, and making valleys and depressions where streams and a pond will form. Do *not* add water to your model at this time.
2. **ADD** small blocks of wood, plastic, or metal to represent the **house** and farm buildings; add twigs to represent **trees**; and add toothpicks to represent **fences**.



3. Spread grass clippings over the areas that represent the **pasture** and hayfield. Stick blades of grass upright into the soil in rows to represent the corn in the **cornfield**. Place small dried peas or beans in rows to represent the potato plants in the **potato field**.
4. Once your model is constructed, simulate **precipitation** using a spray bottle set on the “*fine*” setting. **Continue** spraying until water begins flowing in the valleys and accumulating in the pond area.
5. What happens as you spray more and more water onto the land? Write your observations on your own paper.
6. Why are the streams becoming wider and shallower?
7. What happens when you use a fork to punch small indentations into the pasture, simulating the tracks left by cows? (Be sure to stomp it up a bit!)
8. What happens if you cut the hay (remove the clippings covering the hayfield)?
9. Try the following modifications to the farm, and record their effects on erosion.
 - Plant the rows of corn and potatoes in a different direction.
 - Exchange the locations of the hay crop and corn crop.
 - Add materials to the soil to reduce runoff. Use your imagination to choose materials.
 - Place a narrow strip of carpet in the stream bed to simulate planting the stream bed with grass.
10. What else could you do to your model to slow down the erosion? Try at least three ideas of your own. (Note your changes and their results on your paper.)
11. What could Mr. Katawa do to help solve the erosion problems? List at least five different things he could do to prevent soil erosion and to improve the quality of the soil.