More Food, More Choices

Compare how farming methods affect harvests and resources.

ES.12.a "Evaluate and communicate information describing the impact of measures used to increase the food supply for the growing human population, including the use of GMOs, monocultures, integrated pest management (IPM), and precision agriculture."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline a food-supply benefit and circle a limitation for each of the four methods. Use numbers 1 through 4 to connect each benefit with its limitation.

Decisions at a Maize Farm

1. At a farm outside a growing city, demand for maize rises while farmland stays the same. The farmer plants maize across most fields each year, a practice called monoculture. Growing one crop on a large area makes planting and harvesting with the same equipment faster, which can help supply more food. But insects that feed on maize find a steady food source, and repeated crops can deplete particular soil nutrients. A pest outbreak could then threaten much of the harvest at once. Higher production in an ordinary year does not guarantee a reliable food supply in a bad year.

2. To protect the crop, the farmer considers maize genetically modified to produce a protein from the bacterium Bacillus thuringiensis, or Bt. The protein kills certain insect pests, so this GMO can reduce crop losses and sometimes reduce insecticide spraying. It does not control every pest, and insects can evolve resistance if the same control is used repeatedly. The farmer also uses integrated pest management, or IPM: workers check pest numbers, protect helpful predators, and spray when damage is likely to justify it. IPM can protect the harvest while limiting unnecessary spraying, but checking fields takes time and skill.

3. Precision agriculture offers another way to increase the useful harvest without treating every acre alike. Soil tests and sensors show where maize needs water or fertilizer; equipment then applies different amounts in different areas. Targeting inputs can reduce wasted water and fertilizer runoff while supporting growth where resources are scarce. Yet sensors, software, and equipment cost money, and faulty measurements can lead to poor decisions. No single method solves every problem: the farmer must compare harvests, costs, pest pressure, and environmental effects over several seasons before deciding which combination truly improves the food supply.

2 ANSWER WITH EVIDENCE

Use the passage

1. How could monoculture help this farm supply more maize yet make its harvest less reliable?

2. How could Bt maize reduce crop losses and insecticide use, and what might weaken its effect over time?

3. Why might IPM protect the maize harvest with less spraying, and what does it require from workers?

4. How could precision agriculture support maize growth while reducing waste, and why might a farmer decide against it?

3 YOUR TURN

Your own words

A small farming cooperative faces uneven soil moisture, recurring insect damage, and a limited equipment budget. Recommend two methods from the passage to use together, explain one food-supply benefit and one limitation of each, and name one observation that would help the cooperative judge its plan.

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PART 1 · READ AND MARK

Underline a food-supply benefit and circle a limitation for each of the four methods. Use numbers 1 through 4 to connect each benefit with its limitation. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How could monoculture help this farm supply more maize yet make its harvest less reliable?	**Using the same equipment across large maize fields makes planting and harvesting faster. Insects have a steady food source, so an outbreak could threaten much of the harvest.**
2	How could Bt maize reduce crop losses and insecticide use, and what might weaken its effect over time?	**Its Bt protein kills certain insect pests, reducing damage and sometimes the need to spray. Those insects could evolve resistance if the same control is used repeatedly.**
3	Why might IPM protect the maize harvest with less spraying, and what does it require from workers?	**Workers check pest numbers and spray when likely damage justifies it, rather than spraying unnecessarily. Monitoring fields takes time and skill.**
4	How could precision agriculture support maize growth while reducing waste, and why might a farmer decide against it?	**Tests and sensors guide water and fertilizer to areas that need them, supporting growth and reducing waste. The equipment and software cost money, and faulty measurements can lead to poor decisions.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I recommend IPM and precision agriculture. With IPM, workers could check insect numbers before spraying, protecting crops without spraying when it is not needed. Those checks take time and skill. Precision agriculture could direct water to drier areas and support growth, but sensors and equipment might strain the cooperative's budget. The cooperative could compare harvest amounts over several seasons to judge whether the combined plan helps supply more food.

Accept other supported benefit-limitation pairs from the passage. For the open task, look for two methods used together, a plausible benefit and limitation for each, and an observation that could test the plan.