

**Title:** Barnes Farm GMO Predicament

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**Sentence Description:** This case study is about a family's decision to use genetically modified crops (i.e., GMOs).

**Case Study:**

Emma and Edward Barnes have two teenage children, Amy and Carl. The Barnes have produced delicious sweet corn on their farm for many years. They have proudly produced this corn using native corn seeds that have been passed along from generation to generation. They have supported themselves by selling the corn within their community, and the community has come to depend on this delicious corn. Yield of corn from year to year varies, and during years that corn yield is low, the family's budget is rather tight.

A cause of decreased corn yield for the Barnes family is infestation by the purple corn grub. The purple grub thrives in environments where soil is heavily composted. These insect pests can be controlled naturally by carefully limiting the amount of compost or by using soil insecticides. The Barnes live in an organic community, where people are very health conscious; and the Barnes have resisted the use of insecticides. However, the purple grub blight is becoming a more serious problem, and the Barnes are greatly concerned about their corn crop and their family budget.

Amy and Carl will be graduating from high school within the year, and are worried about being able to afford college. They are strongly interested in attending Bates Agricultural College, and plan to use their degrees to carry on the family farm and to reinvest in the community. Edward and Emma strongly support their children in these goals because of their strong connection to the family farm and to the community. They also feel that they did not attend college themselves, and it is important to them that their children have the opportunity.

During dinner one evening, Amy spoke excitedly about a speaker from Maize, Inc. who spoke to their biology class about genetically modified organisms (GMOs). "There are new genetically engineered corn seeds that are resistant to the purple corn grub!"

Edward has doubts. "Amy, we have been happy with our sweet family corn for generations. Are you seriously entertaining thoughts of us changing our ways?"

Amy, concerned, "Well Dad, we have all been worried about the purple corn grub, and resisting use of insecticides, and so far we are fine, but things are getting worse. How will Carl and I be able to afford to attend college?"

Emma cares about Amy's feelings. "Amy, we will make do, we always do. This is just a bump in the road."

Amy doesn't stop there. "There's more! Maize, Inc. claims that because the corn plants will be resistant to the purple grub, more compost can be used and the yield of corn ears will increase 40%. With extra money from the sales of the increased corn crop, we would be able to farm more of our land and potentially increase sales! They have also made this corn more nutritious!"

“This is an organic community, our sales will decline for sure,” said Edward.

“I think we might want to consider this modern new technology,” voiced Carl, who is very adventurous.

“I am concerned that the texture and taste might not be as sweet and juicy as the corn we’ve been growing our entire lives,” said Emma with concern. “Has the FDA approved these seeds? What tests have been done? Are they safe? How will we convince the neighbors?”

Carl and Amy convinced their parents to think about this, and set out on a mission to find out more information themselves. They understood their parents concerns, but thought the benefits were worth the change. They did some research, and brought their ideas to the next community meeting.

*Ethical Question:* Should Carl and Amy’s parents decide to grow GM crops?

**Guiding Questions:**

1. In your group, discuss the questions/concerns that the Barnes and their community might have, and make a list.
2. Which of these questions can be answered by science (are factual)?
3. What are the
4. Are any of these questions ethical?

**Teacher Resources / Background**

***Ethical Arguments***

<b>Ethical principle</b>	<b>Pro (Yes)</b>	<b>Con (No)</b>
Respect for Persons / Autonomy	<ul style="list-style-type: none"> <li>• The farmers have a right to make this decision, and can decide to have the GM crops, or work harder to keep their farms organic, and possibly be able to charge a higher price for them.</li> </ul>	
Maximize Benefits/ Minimize Harms	<ul style="list-style-type: none"> <li>• The family could have more corn to sell, and their corn might take less pesticide. The corn that is healthier might also be more nutritious.</li> <li>• The family could potentially lose their home and all of the livelihood if the purple corn grub continues to damage their corn crop.</li> </ul>	<ul style="list-style-type: none"> <li>• There are always inherent harms, and the potential build-up for health harms due to the pesticides in the GM crops. Those health harms outweigh the benefits of a larger harvest. In addition, the GM pollen could spread and contaminate organic crops. Pests may evolve to be resistant faster with GM crops. The organic community may be less likely to buy from them.</li> </ul>

Justice	•	<ul style="list-style-type: none"> <li>• The benefits for this may mostly go to the company that engineered the seeds rather than the farmers themselves.</li> </ul>
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### Background – Extra Information for Teachers

NOTE: Prior to this lesson, students will have learned about ethics, recombinant DNA technology, and how GMOs are developed.

### Potential Questions/Concerns for the family

1. How does the family feel about their native corn seeds?
2. Can planting native corn seeds and GMOs harm the native corn? In other words, will native corn plants become pollinated by genetically modified plants?
3. Are GMOs safe to eat?
4. Are they approved by the FDA?
5. Are GMOs harmful to the environment?
6. Are there social objections to changing foods?
7. What are the benefits of GMOs? Native crops?
8. Are GMOs or native foods more nutritious?
9. Who will be affected by a change from native corn to GMOs?
10. Is it less expensive to grow GM foods?

### Extra Resources

- Video Clips

Pesticide Reduction <http://www.monsanto.com/biotech-gmo/asp/default.asp> 3 min 15 sec  
The Impact of GM Crops on Biodiversity

<http://www.monsanto.com/biotech-gmo/asp/default.asp> 4 min 40 sec

Experts Debate the Safety & Benefits of Genetically Modified Crops

<http://www.monsanto.com/biotech-gmo/asp/experts.asp?id=GeneticallyModifiedFoodCrops>

Conversations about Plant Biotechnology <http://www.monsanto.com/biotech-gmo/asp/default.asp>

Monsanto, Benefits of Genetically Engineered Foods, Biotechnology in Africa, Conversations about Plant Biotechnology <http://www.monsanto.com/biotech-gmo/asp/country.asp?cname=south%20africa>

Right Health, Greenpeace alert on genetically modified foods in India

<http://ibnlive.in.com/videos/64470/greenpeace-alert-on-genetically-modified-food-in-india.html>

- Stakeholder analysis worksheets are attached at the end of this document.

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**Activity II**  
Ethical Question

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Use the laptops to see what you can find out about GMOs.

1. In your group, discuss and write down some pros and cons in the following table.

Pros	Cons

2. Who are the stakeholders in this situation?

Stakeholders	What they can gain or lose

3. Consider the pros, cons, and what the stakeholders have to gain or lose. What values are these associated with?

**Homework**

Consider the three principles of ethics:

- a. Respect/Autonomy
- b. Beneficence
- c. Justice

Refer to the ethical question and write a convincing argument to support your ideas. Include your reasoning based on your values and the three principles of ethics.