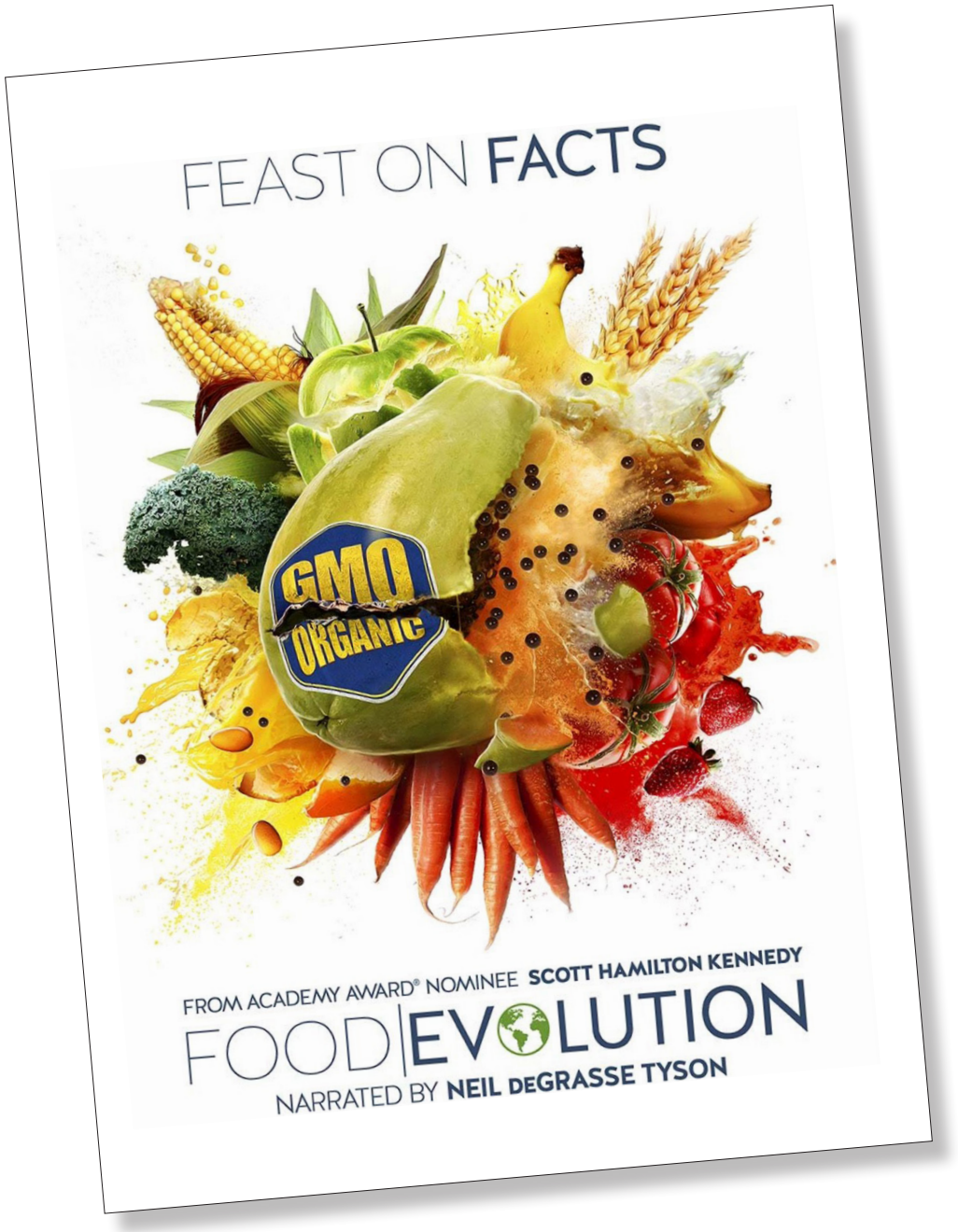
Food Evolution

Manitoba Teacher's Guide



Agriculture in the classroom MANITOBA

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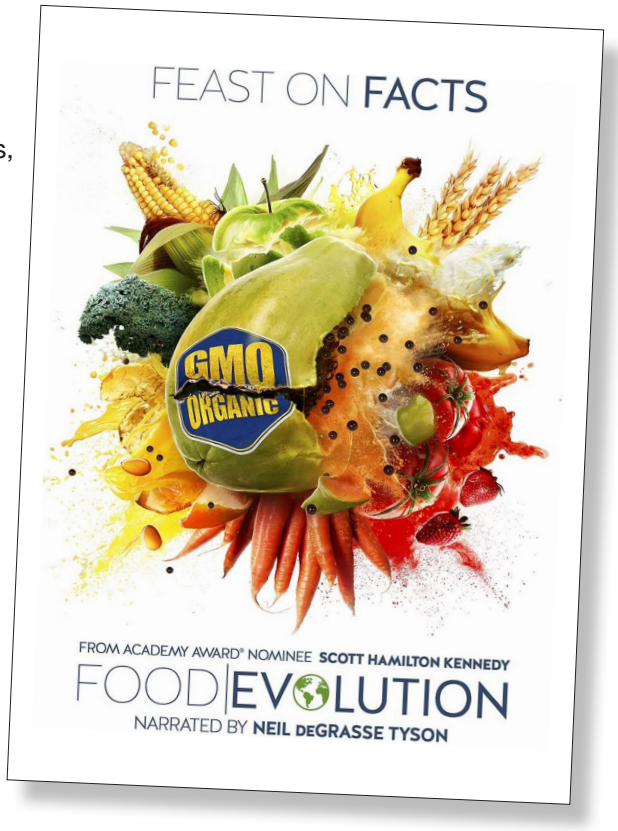
Food Evolution
MANITOBA TEACHER'S GUIDE

ABOUT

This guide has been created by Agriculture in the Classroom – MB (AITC-M) for use by MB teachers. Agriculture in the Classroom – MB is a non-profit that encourages Manitoba students to develop critical thinking skills related to agriculture, food, bioproducts and life sciences. Working with commodity and industry-related organizations, AITC-M's programming, events and services will further develop future decision makers and entrepreneurs.



This guide provides:

- classroom resources specifically for Manitoba teachers and students
- the Manitoba curriculum connections for these resources

It has been designed to be used as a supplement to the international '*FOOD EVOLUTION Educational Resource Guide*' developed by Big Picture Educational Consulting. This guide is available as a download with a licensed copy of the movie for educational use.

FOOD EVOLUTION – BACKGROUND INFORMATION

Please refer to pages 4-15 of the '*FOOD EVOLUTION Educational Resource Guide*' for context and background information about Food Evolution and its key themes including:

- Director's Statement
- About the Film
- Food for Thought: An Overview of Key Themes in FOOD EVOLUTION
  - Unpacking the Public Discourse around Advances in Food and Agriculture
  - Genetic Engineering is a Modern form of Plant Breeding
  - The Scientific Method vs the Single Study Syndrome
  - The Scientific Method and Scientific Consensus
  - What does it mean to be "organic?"
  - How will we ensure food security for future generations?

MB Curriculum Connections

SOCIAL STUDIES

General Skills and Competencies

- Critically analyze and research social issues, including controversial issues.
- Develop openness to new ideas and think beyond the limits of conventional wisdom.
- Distinguish fact from opinion and interpretation, evaluate information and ideas, identify perspectives and bias, and consider the consequences of decisions and actions.

Specific Learning Outcomes

Grade 10 Geographic Issues of the 21st Century

Cluster 3: Food from the Land

S2.3.2-KH-034	Give examples of ways in which food production has changed over time. Examples: soil conservation strategies, technological change...
S2.3.3-KL-022	Explain ways in which natural and human-caused phenomena affect food production.
S2.3.3-KG-037	Give examples of the potential impact of climate change on food production.
S2.3.4-KE-045	Identify issues related to genetic modification of plants and animals.
S2.3.2-KI-005	Identify human factors affecting the production and use of various types of food. Examples: cultural, economic, political, environmental, marketing...

Grade 12 Global Issues: Citizenship and Sustainability

Areas of Inquiry

- Health and Biotechnology
- Sustainable Agriculture
- Environment

Pillars of Learning

- Learning to know - Acquire knowledge and understanding and think critically about our complex and changing world.
  - Develop ecological literacy through an understanding of the interdependence of society, the environment, and the economy.
  - Use creative, critical, and systems thinking to address complex questions.
- Learning to do - Learn to participate effectively in local, national, and global communities.
  - Apply intuitive and innovative thinking and decision-making skills.
  - Plan informed courses of action.
- Learning to live together - Learn to live peacefully with others and to care for our common homeland.
  - Respect Earth as a shared commons made up of complex and interconnected systems.
  - Recognize the solidarity of all human beings and their dependence upon the planet.

Enduring Understandings

- Our decisions and actions matter; they have social, environmental, economic, and political consequences.
- The media do not provide neutral reflections of reality; they affect our decisions and actions.
- Economic and technological development have contributed greatly to society, but often with harmful human and environmental consequences.
- There is no them or over there: we all belong to the human species, our concerns are interdependent, and we are part of the natural world.

Take Action

- Evaluate the purposes of media, critically question information sources and our responses to media, and make decisions accordingly.
- Assess the relative value and sustainability of economic and technological developments in order to make informed decisions.

Ecological Literacy in a Global Issues Course

- It is useful to focus on guiding fundamental questions, which may recur and open up conceptual links across disciplines (e.g., science, geography, anthropology, politics, history, the arts, sociology, health).
- The conceptual links that tie subjects together help make learning more effective, since they lead to learning that is more readily applicable to the real world.

SCIENCE

General Learning Outcomes

A2. Recognize that scientific knowledge is based on evidence, models, and explanations, and evolves as new evidence appears and new conceptualizations develop.

B1. Describe scientific and technological developments—past and present—and appreciate their impact on individuals, societies, and the environment, both locally and globally.

C2. Demonstrate appropriate scientific inquiry skills when seeking answers to questions.

C4. Demonstrate appropriate critical thinking and decision-making skills when choosing a course of action based on scientific and technological information.

C5. Demonstrate curiosity, skepticism, creativity, open-mindedness, accuracy, precision, honesty, and persistence and appreciate their importance as scientific and technological habits of mind.

C8. Evaluate, from a scientific perspective, information and ideas encountered during investigations and in daily life.

Overall Skills and Attitudes

S1-0-2b Evaluate the reliability, bias, and usefulness of information.

S1-0-2d Review effects of past decisions and various perspectives related to an STSE issue.

S1-0-3d Summarize relevant data and consolidate existing arguments and positions related to an STSE issue.

S1-0-3e Determine criteria for the evaluation of an STSE decision. Examples: scientific merit; technological feasibility; social, cultural, economic, and political factors; safety; cost; sustainability

S1-0-8d Describe examples of how technologies have evolved in response to changing needs and scientific advances.

S1-0-9d Value skepticism, honesty, accuracy, precision, perseverance, and open-mindedness as scientific and technological habits of mind.

Specific Learning Outcomes

Grade 12 Biology

Mechanisms of Inheritance Unit

- B12-2-09 - Investigate an issue related to the application of gene technology in bioresources. Include: understanding the technology/processes involved, economic implications, a variety of perspectives, and personal/societal/global implications

FOOD AND NUTRITION

Specific Learning Outcomes

Grade 9

Goal 4 - Demonstrate understanding of relationships and influences around food choices.
9.4.1.1 Identify factors that influence personal food choices (e.g., nutritional, cultural, emotional, environmental, religious, social, ethical, and economic).

Grade 10

Goal 4 - Demonstrate understanding of relationships and influences around food choices.
10.4.1.1 Investigate media and marketing factors that influence personal food choices.

Grade 11

Goal 4 - Demonstrate understanding of relationships and influences around food choices.
11.4.1.1 Investigate media and marketing factors that influence personal food choices.

Grade 12

Goal 2 - Demonstrate understanding of fundamentals of nutrition.
12.2.2.1 Evaluate whether nutrition information/health claims are evidence-based.

Goal 3 - Demonstrate understanding of citizenship and sustainability.
12.3.2.1 Research Canadian practices that reduce the environmental impact of food production and consumption.

Goal 4 - Demonstrate understanding of relationships and influences around food choices.
12.4.1.1 Investigate media and marketing factors that influence personal food choices.

Lesson Plan

OBJECTIVES

The activities below are designed to have students learn:

- information about GMOs
- how science is used and misused to support an argument
- how to determine credible and non-credible sources of scientific information
- to critically think about the media's role in the GMO debate
- to be more discerning consumers of information

MATERIALS

- **Food Evolution movie** in either the 92-minute format or the 52-minute format.
- **Classroom resources**: Included in this lesson plan are 4 student activities as well as an answer key.
  A. Pre-viewing activity
  B. While viewing activity
  C. Post-viewing activity
  D. Final student evaluation survey

THE ACTIVITIES

A. Pre-viewing activity (~ 25 minutes)

Have students use the chart in *Appendix A* to reflect upon and identify their opinions. Have students use questions 2 & 3 to familiarize themselves with some technical terms before watching the film.

B. Viewing activity

Hand out the sheet found in *Appendix B*. Then assign one of the following people to each student.

- Margaret Wille
- Jeffery Smith
- Charles Benbrook
- Dennis Gonzalves
- Alison Van Eenennaam
- Pamela Ronald
- Nathanael Johnson
- Robert Fraley * *92-minute version only*
- Emma Naluyima Mugerwa
- Mark Lynas
- Raoul Adamchuk
- Zen Honeycutt
- Michael Shintaku
- Michael Pollan
- Leena Tripathi
- Andrew Kimbrell
- Bill Nye
- Blake Hurst
- Vani Hari
- Stephanie Seneff
- Vandana Shiva
- Motlatsi Musi

C. Post-viewing activity (approximately 30 – 60 minutes)

Have a class discussion about the information the students gathered on the persons that they were assigned in *B*. Who did they find credible and not credible and why?

Have students complete the post-viewing question sheet in Appendix C. All students can complete *C. Part 1 questions 1 – 4*.

One method to complete the questions in *C. Part 2* is to create home groups of 4 students. Each student in the group is assigned one of the 4 questions in *Part 2*. Once they have had time to complete their individual answer to their question, they meet in expert groups 1 – 4 to discuss and finalize their answers. Then the students can return to their home groups and present their question and answer to the other members of their home group.

D. Final student evaluation survey

Discuss student answers to *C. Part 1 questions 1 – 4*

Students can discuss *C. Part 2* questions in their homegroups.

Then have the students complete the chart in *Appendix D* and compare their answers to the Pre-viewing chart they completed.

Supplemental materials:

The following Agriculture in the Classroom-Canada Snap Ag sheets are 2 page information sheets that can be downloaded at this link https://aitc-canada.ca/en-ca/learn-about-agriculture:

- Advanced Plant Breeding
- What are GMOs
- GMOs around the World
- GMOs and the Environment
- GMO Foods
- Glyphosate

National Geographic article on Plant Geneticist Pamela Ronald and her work developing Sub1 rice. This article also contains Ronald's Ted Talk, 17:49 https://www.nationalgeographic.com/news/2015/05/150502-nginnovators-rice-genetic-engineering-gm-organic-farming-pamela-ronald/

Are GMOs Safe? by William Saletan published in Slate (July 15, 2015), Be sure to try the GMO Shopping Game included in this article. http://www.slate.com/articles/health_and_science/science/2015/07/are_gmos_safe_yes_the_case_against_them_is_full_of_fraud_lies_and_errors.html

Benefits of GM Crops Badly Underestimated by Canadians Stuart Smyth, William Kerr and Peter Phillips in Windsor Star (June 9, 2016) https://windsorstar.com/opinion/columnists/benefits-of-gm-crops-badly-underestimated

My genetically modified crops are everything an environmentalist should want, by Bob Bartley, MB farmer. Published in the Financial Post (April 13, 2016) https://business.financialpost.com/opinion/my-genetically-modified-crops-are-everything-an-environmentalist-should-want

There are no fish genes in tomatoes, by Dr. Joe Schwarcz, McGill University Office for Science and Society https://www.mcgill.ca/oss/article/controversial-science-environment-food-health-news/there-are-no-fish-genes-tomatoes

Food Evolution Answer Key

A. BEFORE VIEWING

Part 1

1. Correlation vs causation
   a) Define correlation – Correlation describes the size and direction of a relationship between two or more variables.
   b) Define causation – is a relationship between 2 or more variables where one variable causes the change in the other variable. This is also referred to as cause and effect.
   c) Both correlation and causation show relationships between 2 or more variables. Correlation however only identifies a relationship while causation identifies a cause and effect relationship. It is difficult to clearly establish cause and effect, but much easier to show correlation.
   d) For example, sales of ice creams and the sales of sunscreen can increase and decrease across a year in a similar manner. This is a correlation. Cause and effect do not exist between sunscreen sales and ice cream sales. Buying sunscreen does not cause you to go and buy ice cream or vice versa.

      There is a causal relationship between weather and sunscreen sales. Hot, sunny weather will cause more people to use and buy sunscreen. There is also a causal relationship between weather and ice cream sales because again hot weather will cause people to buy more ice cream. It is these causal relationships that create the correlation between sales of ice cream and sunscreen.

      The classic causation vs correlation example that is frequently used is that smoking is correlated with alcoholism but doesn't cause alcoholism. While smoking causes an increase in the risk of developing lung cancer.

2. Confirmation Bias
   a) Define confirmation bias:
      i. the tendency to interpret new evidence as confirmation of one's existing beliefs or theories (Google search)
      ii. is the tendency to search for, interpret, favor, and recall information in a way that affirms one's prior beliefs or hypotheses. It is a type of cognitive bias and a systematic error of inductive reasoning. (Wikipedia) (https://en.wikipedia.org/wiki/Confirmation_bias)
      iii. occurs from the direct influence of desire on beliefs. When people would like a certain idea or concept to be true, they end up believing it to be true. They are motivated by wishful thinking. This error leads the individual to stop gathering information when the evidence gathered so far confirms the views or prejudices one would like to be true. Once we have formed a view, we embrace information that confirms that view while ignoring, or rejecting, information that casts doubt on it. Confirmation bias suggests that we don't perceive circumstances objectively. We pick out those bits of data that make us feel good because they confirm our prejudices. Thus, we may become prisoners of our assumptions. (Psychology Today)

B. WHILE VIEWING

This chart contains the name, job title, credentials and GMO position for each of the people highlighted in the film. Since students were asked their opinion about the credibility of the person answers will vary. What is more important is the reasons they give to support their opinion and whether they think confirmation bias is influencing their opinion. Answers will also vary about what was thought provoking.

Name	Job Title	Credentials	Pro/ Anti
Margaret Wille	Hawaii County Council Member	M. Education, Juris Doctorate (JD) Law	anti
Jeffery Smith	Author & Film Maker	Attended the Maharishi Univ. of Management	anti
Charles Benbrook	Research Professor, Washington State University	Ph.D. Ag Economics	anti
Dennis Gonzalves	Emeritus Professor, Cornell University	Ph.D. Plant Pathology	pro
Alison Van Eenennaam	Genetics Science Communicator, University of California	Ph. D Genetics	pro
Pamela Ronald	Plant Pathologist, Professor, Author University of California	Ph.D. Plant Biology	pro
Nathanael Johnson	Food Journalist, Grist Environmental Magazine		pro
Emma Naluyima Mugerwa	Organic Farmer, Veterinarian	Bachelor of Science, Veterinarian Medicine; Master of Science, Health Services Research	pro
Mark Lynas	Environmental Activist, Author	Master of Arts in Modern History & Politics	pro
Raoul Adamchuk	Organic Farmer, Academic Coordinator University of California	Master of Science International Agriculture Development	pro
Zen Honeycutt	Founder of Moms Across America	Bachelor of Arts , Fashion Design	anti
Michael Shintaku	Professor of Plant Pathology, University of Hawaii	Ph.D. Plant Pathology	pro
Michael Pollan	Food Journalist New York Times		pro
Andrew Kimbrell	Global Leader of the Anti-GMO movement Executive Director, Centre for Food Safety	Juris Doctorate (JD) Law	anti
Bill Nye	Science Educator, TV Personality		anti
Leena Tripathi	Plant Biotechnologist, International Institute of Tropical Ag	Ph.D.	pro
Vani Hari	Food Activist 'The Food Babe', Author	Bachelor of Computer Science	anti
Stephanie Seneff	Computer Scientist Massachusetts Institute of Technology	Ph.D Computer Science	anti
Vandana Shiva	Environmental/Anti-globalization activist & author	Ph.D. Philosophy of Physics	anti
Blake Hurst	GM Corn & Soy Farmer Atchison County, MO		pro
Motlatsi Musi	GM Corn & Soy Farmer Johannesburg, South Africa		pro
92-MINUTE VERSION OF THE MOVIE ONLY			
Robert Fraley	Chief Technical Officer, Monsanto	Ph.D. Microbiology/Biochemistry	pro

C. POST-VIEWING

Part 1

1. Answers will vary.
2. Answers will vary.
3. Possible other factors include:
   - Anti-GMO activism
   - Fear based, exaggerated or misleading information on media/social media
   - Confirmation bias
   - Linking GMOs to the notion that big corporations are bad
   - Linking GMOs to pesticides and the notion that all pesticides are equally bad
   - Government bans

   It is important to consider all benefits and drawbacks of a new a technology and put regulatory frameworks, in place to monitor the advancement, use, safety and effectiveness of that technology. People with arguments against the adoption of a new technology do play an important role of providing checks and balances in the system. But when fear based, exaggerated or misleading information are the arguments used to sway the public and create confirmation bias and when activists or other businesses or corporations gain financially from promulgating that kind of information or using this type of marketing then this negatively effects humanities ability to improve food security and adapt to climate change.

   Further to quote Mark Lynas "Misinformation in the rich world is damaging the poor world."

   More factors:
   - Necessity to solve crises in food production
   - Challenge of adapting to climate change and its effects on food production

   Crises in food production can be the factor that allows the application of new technologies. Two examples from the film include:

   i) GE rainbow papaya used to save the Hawaiian papaya industry caused the council to allow rather than ban GE papaya

   ii) Banana wilt disease is causing Uganda's government to reverse the ban on GMOs and put in place legislation to regulate and allow the introduction of approved GE organisms

   Both crises, which could have decreased food security, became the catalyst to allow new technology to increase food security.
4. Answers will vary.

Part 2

1. a) answers will vary

   b) Real world examples from the movie include:
   - the rainbow papaya with a GE resistance to the ringspot virus which was not affected by pesticides
   - golden rice which has been genetically engineered to produce Vitamin A to prevent blindness and death
   - bananas that have resistance to banana wilt disease which is destroying crops in Uganada
   - None of these examples were developed by large corporations, like Monsanto, nor do they increase pesticide use.

   c) Some examples of consequences from the film:
   - The discredited Séralini Study and other misinformation led to a Ugandan government ban on and a public distrust of GMOs. This created a big political obstacle to releasing a genetically engineered banana that was resistant to banana wilt an incurable disease that is destroying the banana plants and undermining food security of small holder farmers.

- Activists have destroyed test plots of GE golden rice delaying research and adoption and children continue to die of disease caused by lack of Vitamin A.
- Actions concerning GMO use in developed countries are impacting African farmer's production choices and income.
- In the 92-minute movie we learn that:
  - People believe GMOs are bad even when they don't know what GMOs are. The debate about GMOs is highly polarized.
  - States are enacting laws banning glyphosate (Roundup) which means farmers are forced to return to more toxic, less effective pesticides to protect crop health.

2. d) Confirmation bias - Once we have formed a view, we embrace information that confirms that view while ignoring, or rejecting, information that casts doubt on it.

   f) Correlation only identifies that a relationship exists between 2 variables while causation identifies a cause and effect relationship.

   g) This graph is not about GMOs. Not all GMOs are resistant to glyphosate. Further, this graph shows only a correlation between glyphosate and autism not a cause and effect relationship.

   h) Since correlations only show that there is a relationship between two variables and nothing more, they provide little information on which to make a decision. However, correlations are often used to incorrectly imply that one variable causes the other. Being able to spot the difference between correlation and causation will allow you to ignore misleading data and make more informed decisions.

3. a) **Emotional examples:**
   - Jeffery Smith knows that when he gives a talk about GMOs that moms with kids who have diseases or disorders may be putting together that they may have hurt their child based on what they ate and that his GMO message generates fear, anger and sadness.
   - Charles Benbrook says anti-GMO activists like Jeffery Smith use fear and go beyond science.
   - Mark Lynas says, "You can try and have public information campaigns but it's much easier to scare people than to reassure them."

   b) **Instinctual examples:**
   - Vani Hari says, 'Who can you trust? You can trust mother nature.'
   - Zen Honeycutt says, 'I trust the social media, blogs more than medical doctors, [and USA government protection agencies]. That's (social media posts) real and I don't need a scientific study for that.

   c) **Logical/rational**
   - Many international science organizations have looked at the valid scientific data and the scientific consensus reached is that current GMOs on the market are safe to eat and safe for the environment.
   - Nathanael Johnson says he researched the health and environmental effects of GMOs and ran out of things to worry about.
   - As Alison Van Eenennaam said, after Bill Nye changed his mind about GMOs, "Change your mind when the data shows you."

4. a) **Areas of common ground include:**
   - Global warming/climate change is a problem
   - Safe abundant nutritious food for all is needed
   - We need to use fewer toxic chemicals on farms around the world
   - We need a more sustainable food system
   - We need to protect the future of the planet and the health of our children

   b) Margaret Wille changed from promoting a total ban on GMOs in Hawaii to voting to ban GMOs but allow an exception for the rainbow papaya to allow the papaya industry to continue.

   Emma Naluyima Mugerwa after talking to Leena Tripathi and touring the GMO wilt resistant banana research plot decided that GMOs were not bad like they say. She is encouraging Ugandan farmers to accept and spread the word about the value of science and genetic engineering.

   Mark Lynas – after studying the science of genetic engineering is no longer an anti-GMO activist. He said, "I'm not fighting for GMOS, I'm fighting for the ability to use science to make the best decisions that we can. If you throw science out, then there's nothing – there's just kind of an amorphous blob of competing world views."

   Bill Nye – was originally anti-GMO but after spending time with the scientists at Monsanto and looking in depth at the science data and facts of genetic engineering became pro-GMO.

   Kenyan Government passed that the ban on GMO foods be lifted and that GMO adoption be considered on a case by case basis.

   In the 92-minute version only:
   Andrew Kimbrell – was anti-pesticide and anti-GMO but conceded that banning the pesticide glyphosate which is used in partnership with some specific GMO crops actually meant that farmers were having to go back to using more toxic pesticides that glyphosate had replaced.

Name: _____

Food Evolution - Pre-Viewing

YOUR OPINIONS

1. Circle the number that best reflects your opinion. The closer the number to the statement the stronger you hold that opinion. For example, circling **1** means that you strongly believe that GMOs are bad. Circling **5** means that you strongly believe GMOs are good. If you have no opinion, then circle **3**.

a.	GMOs are bad.	1	2	3	4	5	GMOs are good.
b.	I do not have a good understanding of what a GMO is.	1	2	3	4	5	I have a good understanding of what a GMO is.
c.	I do not understand the scientific process.	1	2	3	4	5	I understand the scientific process.
d.	I do not understand the difference between correlation and causation of data.	1	2	3	4	5	I understand the difference between correlation and causation of data.
e.	I believe that science and technology are undermining the sustainability of our food system.	1	2	3	4	5	I believe that science and technology are the key to insuring the future sustainability of our food system.
f.	Marketing and advertising information about food is a good source of information.	1	2	3	4	5	Marketing and advertising information about food is often misleading.
g.	Scientific consensus does not influence my decision making.	1	2	3	4	5	Scientific consensus provides good information on which to make decisions.
h.	I am swayed more by emotional arguments.	1	2	3	4	5	I am swayed more by factual arguments.
i.	I do not like innovation and change.	1	2	3	4	5	I embrace innovation and change.

2. Correlation vs Causation
   a. Define correlation.
   b. Define causation.
   c. Explain the difference between causation and correlation.
   d. Give an example of a correlation that is not a causation.

3. Confirmation Bias
   a. Explain what confirmation bias is.
   b. In order to be conscious of your own conformational bias about GMOs, before watching the film, describe what you believe to be true about GMOs and their benefit or harm and why?

Agriculture in the classroom MANITOBA

Name: _____

Food Evolution - Viewing Activity

Your teacher will assign to you one person who appears in the film. Identify the following for that person.

Person's Name: _____

Job Title: _____

Credentials (training/university degrees/experience):

_____

Are they pro GMO or anti GMO? (check one)

☐ Pro GMO ☐ Anti GMO

Rank this person as a source of GMO information. (check one)

Be prepared to give reasons for your choice.

☐ Not a credible source

☐ Somewhat credible source

☐ Very credible source

Did your opinion about the person's credibility change while watching the movie? (check one)

Be prepared to give reasons for your choice.

☐ Yes ☐ No

What did this person say that was most thought provoking for you?

_____

_____

_____

_____

_____

_____

Name: _____

Food Evolution - Post-Viewing Questions

PART I: COMPLETE THE FOLLOWING QUESTIONS.

1. What is one thing that surprised you in this film?

_____

_____

_____

_____

2. What is one new piece of data that you learned from this film about GMOs and the history of Genetic Engineering (GE) technology?

_____

_____

_____

_____

3. Identify 2 or more factors besides science that are affecting the application of new technology, like GMO genetic engineering, to solve the challenge of feeding the world and describe whether each factor is having a positive or negative effect on improving food security.

_____

_____

_____

_____

4. The Pew Research study shows 88% of scientists believe GMOs are safe for human consumption compared to only 37% of the public, the largest gap of any politicized scientific topic. The majority of the public trusts the scientific community on evolution, vaccines and climate change. After watching this film, why do you think there is such a difference between public opinion and scientific consensus when it comes to GMOs?

_____

_____

_____

_____

Agriculture in the classroom MANITOBA

Name: _____

Food Evolution - Post-Viewing Questions

PART 2: COMPLETE *ONE* OF THE FOLLOWING QUESTIONS:

1. In mainstream and social media, the safety of GMOs is often combined with concerns about pesticide use, and the trustworthiness of Monsanto.

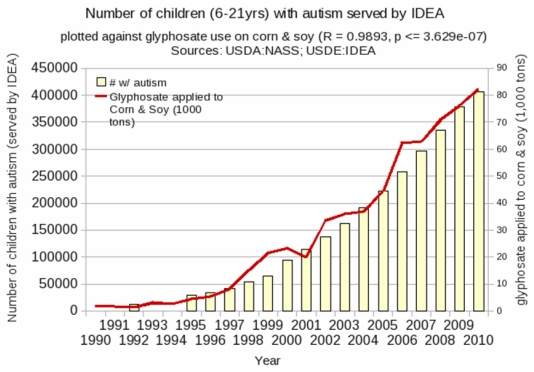
a. How and why do you think this happened?

b. Do you think this has led to a misrepresentation of GMOs and what they are? Explain. Support your answer with GMO examples from the movie.

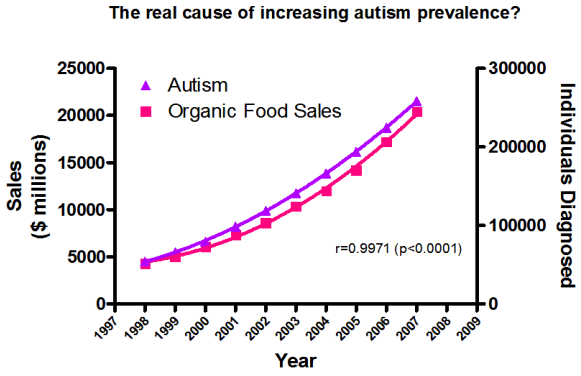
c. Give examples of some of the real-world consequences resulting from this media coverage?
Suggested resource for this question: *Learn GMO GMO vs Organic: Fake News?*
https://www.youtube.com/watch?v=cYqgWebr52A

2.

#1



#2



a. Which of these graphs seems more believable? Less believable?

b. If one graph seems more believable than the other why do you think that is?

c. What is the current messaging in mainstream and social media about:
- GMOs
- Organic food

d. Define confirmation bias.

e. If one graph seemed to be more believable than the other do you think that confirmation bias played a role in that perception?

f. Both graphs are correlations. Describe the difference between correlation and causation.

g. Near the beginning of the film, Stephanie Seneff, Ph.D. Computer Scientist MIT used graph 1 to support her view that GMOs were not safe. Give reasons why this graph does not provide valid evidence to support her view.

h. How can an understanding of correlation and causation help you make better decisions about controversial topics?
Suggested resources to help you understand correlation vs causation:
- TEDx Talks Published on Nov 5, 2012, *The danger of mixing up causality and correlation: Ionica Smeets* at TEDxDelft, 5:56 https://www.youtube.com/watch?time_continue=344&v=8B271L3NtAw
- TEDx Talks Published on Nov 3, 2016, *How to defend yourself against misleading statistics in the news* | Sanne Blauw | TEDxMaastricht 16:20 (correlation/causation found at 12:11 – 16:20), https://www.youtube.com/watch?v=mJ63-bQc9Xg)

Name: _____

Food Evolution - Post-Viewing Questions

PART 2: COMPLETE *ONE* OF THE FOLLOWING QUESTIONS:

3. One way of describing how humans make decisions is that they use their heart (emotions), gut (instinct) and head (logic). Emotional and instinctual decisions tend to be more automatic and require less work and energy. Logical decisions require the gathering of facts and critical thinking which requires more work and energy. Therefore, appeals to emotion (fear, outrage) or instinct (that's not natural) tend to be more powerful and lead to quick decisions compared to appeals to logic (detailed information, facts, scientific consensus). However, to make good decisions you need to use your heart, your gut and especially your head.

a) Give examples from the film where each of the following were made and by whom:
   i. Emotional arguments about GMO
   ii. Instinctual arguments about GMO
   iii. Logic/rational arguments about GMO

b) Which type of argument did you find most powerful?

c) Which type of argument did you find most useful?

4. In a healthy democratic and intellectual environment, scientists, policymakers, politicians, academics, and citizens are able to fiercely defend their positions, but simultaneously find common ground to establish consensus and successfully create change – and be willing to change their minds, if the facts deem it necessary.

a. From the film identify areas of common ground about food, food security and the environment held by all sides of the GMO debate.

b. Identify one person in the film who changed their mind about GMOs and give their reasons for doing so.

Name: _____

Food Evolution - Post-Viewing

YOUR OPINIONS

1. Circle the number that best reflects your opinion now. The closer the number to the statement the stronger you hold that opinion. For example, circling **1** means that you strongly believe that GMOs are bad. Circling **5** means that you strongly believe GMOs are good. If you have no opinion, then circle **3**.

a.	GMOs are bad.	1	2	3	4	5	GMOs are good.
b.	I do not have a good understanding of what a GMO is.	1	2	3	4	5	I have a good understanding of what a GMO is.
c.	I do not understand the scientific process.	1	2	3	4	5	I understand the scientific process.
d.	I do not understand the difference between correlation and causation of data.	1	2	3	4	5	I understand the difference between correlation and causation of data.
e.	I believe that science and technology are undermining the sustainability of our food system.	1	2	3	4	5	I believe that science and technology are the key to insuring the future sustainability of our food system.
f.	Marketing and advertising information about food is a good source of information.	1	2	3	4	5	Marketing and advertising information about food is often misleading.
g.	Scientific consensus does not influence my decision making.	1	2	3	4	5	Scientific consensus provides good information on which to make decisions.
h.	I am swayed more by emotional arguments.	1	2	3	4	5	I am swayed more by factual arguments.
i.	I do not like innovation and change.	1	2	3	4	5	I embrace innovation and change.