Unit 4: Food

Unit Objectives

At the end of this unit the students will be able to:

- Describe the sources of greenhouse gas emissions in the food system
- Identify ways to reduce emissions in individuals' diets and the food system as a whole
- Demonstrate understanding and develop an interpretation of grade level informational text **(Science Standard)**
- Evaluate the significance and accuracy of information **(Science Standard)**
- Clarify key aspects of an event, issue, or problem through inquiry and research. **(Social Studies Standard)**
- Gather, interpret, use, and document information from multiple sources, distinguishing facts from opinions and recognizing points of view. **(Social Studies Standard)**
- Examine a controversial event, issue, or problem from more than one perspective. **(Social Studies Standard)**
- Examine the various characteristics, causes, and effects of an event, issue, or problem. **(Social Studies Standard)**

Unit Background

Lesson 4A
Food-related GHG Emissions (50-60 minutes)

Lesson 4B
Meat Consumption Debate (30-60 minutes)

Unit 4 Quiz
15 minutes

Unit 4 Appendix

Unit Background

The average U.S. household is responsible for about eight tons of carbon dioxide equivalent (CO_2e) emissions annually related to their food consumption. Fortunately, these emissions are very flexible, as we can change the carbon footprint of our diet with every meal choice.

Modern agriculture relies on large expenditures of fossil fuels at all levels of food production and distribution, from plowing and fertilizing fields, to transporting crops to storage, to processing and packaging products, to the final trip to the consumer's home (where further energy is used to store and prepare food). Moreover, at every stage of this process, food is wasted and thrown away.

When looking at the full life-cycle of the food system, including production, transportation and distribution of food, the vast majority of food-related emissions, 83%, derive from the production phase, with transportation accounting for just 11%. The growing body of research on the food system's carbon footprint shows that cutting down on red meat and dairy are a surefire way to trim emissions. Eating locally, while important for food security and the local economy, plays only a minor role in reducing food emissions. Other strategies for reducing food emissions, like eating unprocessed and organic foods and avoiding food waste also play a part in reducing emissions.

Animal Products

According to the Food and Agriculture Organization of the United Nations, livestock uses 30% of the world's surface land area and accounts for a whopping 18% of CO_2e emissions, including those from land use changes, fertilizers for feed, and energy use. The Environmental Protection Agency's 2007 Greenhouse Gas Emissions Inventory shows that livestock is responsible for about half of the emissions from the agricultural sector.

For the other components of our personal climate footprint, such as energy use and transportation, CO_2 is the major offender. In the case of food-related emissions, half are in the form of methane and nitrous oxide. The vast majority of these methane and nitrous oxide emissions are related to livestock.

The methane in our food system largely results from enteric fermentation, or the digestive process of ruminants like cows and goats. Cows and other ruminants raised for dairy and meat actually burp methane (which has twenty-one times the warming potential of carbon dioxide) as their four stomachs digest fibrous grass that makes up their diet. Cows raised on corn belch even more methane than grass-fed cows. According to the Environmental Protection Agency, globally, this methane makes up 28% of all methane released by human-related activities!

Nitrous oxide (N_2O) is produced naturally through the microbial nitrification and denitrification processes in soils. However, adding nitrogen to the soil through chemical and organic fertilizers, manure, nitrogen fixing crops and other means increase the soil's production of N_2O. Livestock use 78% of all agricultural land and 33% of cropland globally for grazing and for feed production. As a result, 65% of global N_2O emissions are related to raising livestock, according to the UN Food and Agriculture Association.

Carbon dioxide emissions from livestock come from land use changes and energy use. Feedlots (a type of confined-animal feeding operation) rely on antibiotics and grain production to increase meat yields, the production of which requires energy inputs. Much large-scale meat production occurs in areas that have been recently deforested for production of animal products or their feed. The total cost to the atmosphere of meat production embodies the loss of forests that fix, or sequester, CO_2—many of them in tropical areas where plants are able to photosynthesize year-round, so that loss can be huge.

Researchers at Carnegie Mellon found that switching from red meat or dairy to another protein source one day a week has the same impact on emissions as eating a pure "local" diet that includes red meat and dairy. A University of Chicago study compared the average American diet, which includes red meat, to the emissions produced by a Chevrolet Suburban; the lacto-ovo vegetarian diet (which includes dairy and eggs) was much closer to the emissions of a Toyota Prius, a low-carbon emissions car.

This study also found that a diet rich in fish nearly equaled the emissions associated with a red-meat diet. Deep-sea fishing requires large amounts of fossil fuel in catching, storing, and transporting fish from sea to market. Because many of the world's fisheries have collapsed due to over-fishing, fishing methods have become increasingly invasive and destructive on marine ecosystems.

Comprehensive research prioritizing various dietary choices is recent and continues to emerge.

Whole Foods

Processing and packaging foods is an energy-intensive practice—and we're surrounded by a multitude of these products. Of the total amount of energy used in the United States, about 16% is consumed by the food production system. Of that 16%, nearly a third is used for processing, 10% for transportation, and 17.5% for agriculture. On-farm energy use accounts for 1% of the US total energy related CO_2 emissions, with a third of that going to electricity use and nearly half going to diesel. Therefore, buying unprocessed foods with less or no packaging is typically far less impactful than buying processed and heavily packaged foods.

Waste

Americans throw away about a quarter of the food we prepare, at a cost of a billion dollars a year, according to the Environmental Protection Agency (EPA). Food scraps made up 12.5% of the solid waste generated by American households in 2007. This uneaten food causes emissions upstream, before the food reaches its intended point of use, and downstream, in the landfill. Upstream emissions are from growing, transporting and processing the food, while downstream emissions are the methane released from organic material decomposing anaerobically (without oxygen) in the landfill. Clearly, doing your best to gauge food purchases and preparation can cut down on the emissions associated with the lifecycle of wasted food.

Transporting Food

Despite the recent focus on transportation from farm to store, these so-called "food miles" account for only 4% of our food-related emissions, with transportation as a whole making up 11% of food-related emissions. However, disruptions to the food supply are one projected impact of climate change due to changes in weather, water supplies, and distribution systems. Eating local foods could help protect your community against these risks by building a more resilient local food system.

"Eating with the seasons" can increase the chances of finding food produced locally, in-season, and more efficiently. Food grown locally, but out of season, can require additional energy for production in heated greenhouses. For example, a study in the UK found that the energy used to grow hothouse tomatoes in winter

Into the Trash It Goes

A federal study found that 96.4 billion pounds of edible food was wasted by U.S. retailers, food service businesses and consumers in 1995 — about **1 pound of waste per day** for every adult and child in the nation at that time. That doesn't count food lost on farms and by processors and wholesalers.

For a family of four people, that amounted to about **122 pounds of food thrown out each month** in grocery stores, restaurants, cafeterias and homes. Here is a depiction of that family's monthly share, the sum of waste in eight different food groups as detailed in the study.

Source: United States Department of Agriculture; Census Bureau

BILL MARSH AND KARI HASKELL/THE NEW YORK TIMES; PHOTOGRAPH BY TONY CENICOLA/THE NEW YORK TIMES

Retrieved from: *http://www.nytimes.com/imagepages/2008/05/18/weekinreview/18martin-popup.html*

in England (for heating or lighting) is greater than the energy needed to grow and import tomatoes from Spain shipped by truck.

The trip from supermarket to home can contribute among the largest expenditures of energy in the foods' travels. Consider that a truck carrying tomatoes will be packed to the brim, using one engine to carry pounds and pounds of tomatoes. We might carry just two bags of groceries home in our otherwise empty vehicle. Most of the fossil fuels burned in that journey home are being used to move the hulking body of the vehicle, rather than to move our groceries. Ways to lessen food transportation emissions are a) grow a portion of your own food; b) bike, walk, or use public transportation to do your shopping; c) plan ahead to make fewer trips to the store.

Organic

Modern conventional agriculture relies heavily on fossil fuel, and therefore results in greenhouse-gas emissions, in almost every aspect of production, including:

- Fuels burned in machinery.
- Fertilizers, pesticides, herbicides, and fungicides used in farming are made from fossil fuels, release nitrous oxide (a greenhouse gas), and require energy for transportation and production. Synthesizing nitrogen for fertilizers requires massive amounts of energy.
- Embodied emissions—those produced in the manufacture and maintenance of a product, to its point of use—in machinery used for plowing, harvesting, and irrigation.

Organic farming methods typically require less fossil fuel use because they do not rely on chemical fertilizers; organic farms are also limited in the amount and types of pesticides that can be used. A 22-year study from the Rodale Institute demonstrated that conventional farming methods require 3.7 barrels of oil per hectare of crop production, while organic farming methods needed only 2.5 barrels of oil to produce the same crop yield. Organic farmers rely less on machinery and more on labor-intensive practices to weed and harvest fields. The same study concluded that fields farmed organically stored at least twice, and up to three times, as much carbon than fields farmed using conventional methods. Eating more organic foods can decrease your own and your farmers' exposure to chemicals, while also lessening your impact on global warming.

Sources:

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United States Environmental Protection Agency, "Basic Information about Food Scraps," http://www.epa.gov/osw/conserve/materials/organics/food/fd-basic.htm

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Lesson 4A—Food-Related Greenhouse Gas Emissions

Objectives

- Students will become familiar with food-related GHG emissions.
- Students will learn which dietary choices result in the lowest GHG emissions.

Suggested Timing

(50-60 minutes)

- 10 minutes—Introduction to Unit
- 5 minutes—Introduction to Lesson
- 20-30 minutes—Activity
- 15 minutes—Post-Activity discussion

Materials

- Computers with internet access
- Copies of Student Worksheet 4A
- Pencils

Teacher Information

Food production accounts for one-third of global greenhouse gas (GHG) production. Luckily, with every meal we eat we have the opportunity to reduce our food-related emissions and therefore our contributions to global climate change. We can reduce our GHG levels with each meal, as described broadly below, and in the unit introduction in detail.

1. *Reduce the amount of beef and/or dairy that you consume*. According to the United Nations, raising cattle produces more GHGs than driving cars. If every American reduced their consumption of cheeseburgers by one a week it would be equivalent to taking approximately 6.5 million SUVs off the road for a year! *http://openthefuture.com/cheeseburger_CF.html*
2. *Decrease food waste*. According to the EPA, Americans waste 27% of food available for consumption and 40-50% of food produced is never consumed. This accounts for over 30 million tons of food waste every year. All of that food production results in the emission of GHGs that could have been avoided.
3. *Eat more whole and unpackaged food*. Whole-foods are not processed and therefore do not produce the GHGs associated with the energy of processing. Producing packaging requires energy and as a result produces GHGs.
4. *Eat organically-grown food.* These foods are produced using non-fossil fuel-based fertilizers. Soil that has been farmed organically results in a buildup of organic matter, and therefore is better at storing carbon and serving as a "carbon sink" than the soil at conventional farms.
5. *Eat local food, particularly in-season.* "Food-miles" produce approximately 4% of total food-related GHG emissions (the transportation of food from the farm to the grocery store). By buying local food you are not only supporting local farmers and therefore the local economy but also reducing your GHG emissions.

Discussion

This outline highlights the key points to be shared with students.

1. Discuss sources of food-related emissions – methane, nitrous oxide and carbon dioxide.
   a. CO_2 and N_2O associated with growing food
      i. On-farm energy use leads to CO_2 emissions (but only 1% of US total energy use)
         1. Electricity amounts to 30% of agricultural energy use
         2. Diesel for tractors, etc. accounts for 46% of agricultural energy use
      ii. Fertilizer application leads to N_2O emissions. Discuss the nitrogen cycle in greater detail here if desired.
   b. NH_4 and N_2O emissions associated with raising cattle/other animals
      i. Nitrous oxide from land used for growing feed.
      ii. Methane produced by cows (yes, cow burps.)
   c. CO_2 emissions associated processing and packaging food.
   d. CO_2 emissions from other food-related energy use:
      i. Transportation to store, and transporting from store to home.
      ii. Energy used by retailers.
      iii. Energy used for food storage (refrigerators and freezers) and cooking.
2. Discuss the importance of consumer choices, as well as the various factors like religion, allergies and personal preference that play into our dietary choices. These points should be covered in the discussion that follows the activity. Strategies for emission reduction include:
   a. Reduce consumption of meat/dairy products.
   b. Decrease food waste.
   c. Eat more whole or unpackaged foods.
   d. Eat organically grown food.
   e. Eat local food.
3. Emphasize that a student does not need to radically change their diet to decrease food-related GHG emissions; small changes can make big differences.

Lesson

1. Pass out copies of the Student Worksheet and explain how they will be trying to find the foods with the lowest and highest emissions. The object of the game is to create the meals with the lowest and highest GHG emissions.
2. Have the students go to *http://www.eatlowcarbon.org/* and explain how they look up the greenhouse gas emissions of each food or menu item in an allotted time period (otherwise students might spend hours here). You might want them to start by clicking on "Getting Started."
3. Make sure that the students pay particular attention to portions so that their meals are realistic. (i.e., they can't put one ounce of meat and count it as a full portion!)
4. Ask the students for the total emissions from their lowest and highest meals. This exercise can be done in teams.

Discussion Questions

Discuss the results with the class; consider a few or all of these questions:

- Does reducing your GHG emissions mean that you cannot eat meat?
- What change has a bigger impact, a person who reduces their meat consumption from three to two times a week, or a person who consumed meat once a week becoming a vegetarian? In other words, do you have to become a vegetarian to make a difference?
- What foods surprised you with their CO_2 output? Were they higher or lower in GHG emissions than you thought?
- How could you apply what you learned today into your everyday life? Is there one pledge you could make (e.g., I will consume less soda and more water, or I will consume one less meal with beef/dairy per week)?
- How would planting your own vegetable garden be helpful in terms of GHG emissions and climate change?

How can we view reducing our food GHG emissions as an opportunity? Is there information you learned that could save you and your family money? Would there be other benefits to making those changes? What might some of the challenges be?

Student Worksheet

Name:_____

List the food you chose for each item. Aim for a well-balanced meal that someone would actually eat (includes proteins, carbohydrates and fats. Not too big, not too small).

Breakfast	**Highest CO_2e Food Item**	**CO_2e Emissions**	**Lowest CO_2e Food Item**	**CO_2e Emissions**
Item 1				
Item 2				
Beverage				
Total				
Lunch				
Item 1				
Item 2				
Item 3				
Beverage				
Total				
Dinner				
Item 1				
Item 2				
Item 3				
Item 4				
Beverage				
Total				
Daily Total				

Lesson 4A Assessment

Aspect	Expert (4)	Practitioner (3)	Apprentice (2)	Novice (1)	Score
Participation in research	Participates fully in research without guidance.	Participates in research with some guidance.	Participates with a great deal of guidance.	Does not participate in research.	
Worksheet	Worksheet is complete with all entries showing thoughtfulness.	Worksheet is complete with most entries showing thoughtfulness.	Worksheet is incomplete and lacks thoughtfulness.	Worksheet is not attempted.	
Post Worksheet Communication	Clearly communicates subject understanding during class discussion.	Clearly communicates some subject understanding during class discussion.	Communicates minimal subject understanding and needed to be called upon during class discussion.	Shows no subject understanding and did not participate in class discussion.	
				Total Score	**/12**

Objective Check

1. Name three sources of food-related GHG emissions: (Answers will vary but may include methane from cows, transportation related emissions, nitrous oxide from fertilizer.)
2. What is one simple activity you plan to do to reduce your food-related GHG emissions? (Answers will vary but may include decreasing meat or dairy consumption, eating local, wasting less food, eating organic, eating whole foods.)

Lesson 4B—Meat Consumption Debate

Objectives

- Students will become familiar with two sides of a debate about cutting meat consumption.
- Students will attempt to analyze these positions to distinguish fact from opinion.
- Students will express their own opinions on the subject of meat consumption.

Suggested Timing

(30-60 minutes)

- 15 minutes—Introduction to lesson
- 20-30 minutes—Reading (in-class or homework)
- 15 minutes—Post-reading discussion

Materials

- Class set of *The Meat of the Problem* and *A Flawed Look at the Meat Industry* from The Washington Post.
- Class set of *Meat, Climate Change and Industry Tripe* from Grist.com.

Information

The Washington Post's economic policy blogger Ezra Klein sparked a debate with his article on cutting back on beef consumption. People defended their right to eat as much beef as they cared too, others accused Mr. Klein of not going far enough in his calls for reduced meat consumption, and some defended the beef industry.

This lesson has the students critically reading a blog article and the rebuttal from the representative of J. Patrick Boyle, the President and Chief Executive of the American Meat Institute in Washington. The students may do this as individuals or as a class. The students will then either write or discuss their opinions.

After responding to the original two articles, students continue by reading a follow-up fact check of the two authors printed at Grist.com by Tom Philpott.

Read *http://news.bbc.co.uk/2/hi/science/nature/7600005.stm* for more information on meat consumption or see the resources listed in the unit introduction.

Discussion

This outline highlights the key points to be shared with students.

1. Review food-related GHG emissions from eating meat.
   a. Eating beef produces a greater amount of GHG than other meats due to the high level of methane emissions from enteric fermentation.
   b. All meats must convert grains/plants into meat, which is less efficient than eating the grains/plants directly.
3. Discuss the two articles that the students will be reading.
   a. Ezra Klein—The Meat of the Problem
      i. An opinion piece in the Washington Post
      ii. Ezra Klein is the Economic Blogger for the Washington Post
   c. J. Patrick Boyle—A Flawed Look at the Meat Industry
      i. A rebuttal letter to the Washington Post
      ii. J. Patrick Boyle is the President and Chief Executive of the American Meat Institute in Washington.
3. Introduce the Critical Thinking Questions
   a. Opinion questions
      i. Asking viewpoints
      ii. Synthesizing ideas
   c. Analytical questions
      i. Reading to verify facts
      ii. Analyzing the quality of arguments/points

Preparation

- Photocopy the articles.
- Choose several or all of the questions from the "Critical Thinking Questions." Either distribute them to the students or post them on the board *before* the students read the articles.

Lesson

1. Before handing out the reading, introduce the critical thinking questions. These can be assigned as written reflections or for a class discussion.
2. Hand out the reading. The articles can be read in class as a group or individually. Alternatively, the reading can be assigned as homework. If you choose to do this, make sure the students have a copy of the critical thinking questions.
3. Have the students work on the questions individually or discuss them as a group.
4. Much of the analytical work requires the student to know which of the "facts" given by the two authors are supported by scientific research. The Philpott article breaks down the debate and lets the reader know veracity of the authors' statements. Photocopy the article and distribute after the students have had time to do some critical thinking. Ask the students if the Philpott article changes their minds at all.

Critical thinking questions

Consider a few or all of these questions:

1. What is your general reaction to Ezra Klein's suggestion of cutting down on meat consumption?
2. Who do you tend to believe more, Ezra Klein or J. Patrick Boyle? Why? What might motivate the authors to write their respective pieces?
3. Do you think your belief can be affected by your personal opinions on the topic? In other words, do you think a vegetarian would be more likely to believe Mr. Klein because he supports his opinions, while a meat eater might be inclined towards Mr. Boyle's position?
4. What do you think of the PBJ project? Would you be willing to try it?
5. If you had to do one thing to cut down your food-related GHG emissions, what would it be?
6. What do you think is more motivating about eating less red-meat (if any): saving money, being healthy or reducing your GHG emissions? Why?

The Meat of the Problem

By Ezra Klein

Wednesday, July 29, 2009

The debate over climate change has reached a rarefied level of policy abstraction in recent months. Carbon tax or cap-and-trade? Upstream or downstream? Should we auction permits? Head-scratching is, at this point, permitted. But at base, these policies aim to do a simple thing, in a simple way: persuade us to undertake fewer activities that are bad for the atmosphere by making those activities more expensive. Driving an SUV would become pricier. So would heating a giant house with coal and buying electricity from an inefficient power plant. But there's one activity that's not on the list and should be: eating a hamburger.

If it's any consolation, I didn't like writing that sentence any more than you liked reading it. But the evidence is strong. It's not simply that meat is a contributor to global warming; it's that it is a huge contributor. Larger, by a significant margin, than the global transportation sector.

According to a 2006 United Nations report, livestock accounts for 18 percent of worldwide greenhouse gas emissions. Some of meat's contribution to climate change is intuitive. It's more energy efficient to grow grain and feed it to people than it is to grow grain and turn it into feed that we give to calves until they become adults that we then slaughter to feed to people. Some of the contribution is gross. "Manure lagoons," for instance, is the oddly evocative name for the acres of animal excrement that sit in the sun steaming nitrous oxide into the atmosphere. And some of it would make Bart Simpson chuckle. Cow gas—interestingly, it's mainly burps, not farts—is a real player.

But the result isn't funny at all: Two researchers at the University of Chicago estimated that switching to a vegan diet would have a bigger impact than trading in your gas guzzler for a Prius. A study out of Carnegie Mellon University found that the average American would do less for the planet by switching to a totally local diet than by going vegetarian one day a week. That prompted Rajendra Pachauri, the head of the United Nations Intergovernmental Panel on Climate Change, to recommend that people give up meat one day a week to take pressure off the atmosphere. The response was quick and vicious. "How convenient for him," was the inexplicable reply from a columnist at the Pittsburgh Tribune Review. "He's a vegetarian."

The visceral reaction against anyone questioning our God-given right to bathe in bacon has been enough to scare many in the environmental movement away from this issue. The National Resources Defense Council has a long page of suggestions for how you, too, can "fight global warming." As you'd expect, "Drive Less" is in bold letters. There's also an endorsement for "high-mileage cars such as hybrids and plug-in hybrids." They advise that you weatherize your home, upgrade to more efficient appliances and even buy carbon offsets. The word "meat" is nowhere to be found.

That's not an oversight. Telling people to give up burgers doesn't poll well. Ben Adler, an urban policy writer, explored that in a December 2008 article for the American Prospect. He called environmental groups and asked them for their policy on meat consumption. "The Sierra Club isn't opposed to eating meat," was the clipped reply from a Sierra Club spokesman. "So that's sort of the long and short of it." And without pressure to address the costs of meat, politicians predictably are whiffing on the issue. The Waxman-Markey cap-and-trade bill, for instance, does nothing to address the emissions from livestock.

The pity of it is that compared with cars or appliances or heating your house, eating pasta on a night when you'd otherwise have made fajitas is easy. It doesn't require a long commute on the bus or the disposable income to trade up to a Prius. It doesn't mean you have to scrounge for change to buy a carbon offset. In fact, it saves money. It's healthful. And it can be done immediately. A Montanan who drives 40 miles to work might not have the option to take public transportation. But he or she can probably pull off a veggie stew. A cash-strapped family might not be able buy a new dishwasher. But it might be able to replace meatballs with mac-and-cheese. That is the whole point behind the cheery

PB&J Campaign, which reminds that "you can fight global warming by having a PB&J for lunch." Given that PB&J is delicious, it's not the world's most onerous commitment.

It's also worth saying that this is not a call for asceticism. It's not a value judgment on anyone's choices. Going vegetarian might not be as effective as going vegan, but it's better than eating meat, and eating meat less is better than eating meat more. It would be a whole lot better for the planet if everyone eliminated one meat meal a week than if a small core of die-hards developed perfectly virtuous diets.

I've not had the willpower to eliminate bacon from my life entirely, and so I eliminated it from breakfast and lunch, and when that grew easier, pulled back further to allow myself five meat-based meals a month. And believe me, I enjoy the hell out of those five meals. But if we're going to take global warming seriously, if we're going to make crude oil more expensive and tank-size cars less practical, there's no reason to ignore the impact of what we put on our plates.

A Flawed Look at the Meat Industry

Monday, August 3, 2009

Ezra Klein's commentary "The Meat of the Problem" [Food, July 29] was inaccurate and not scientifically based. The U.N. report "Livestock's Long Shadow," the foundation for Mr. Klein's commentary, asserted that the livestock sector is responsible for 18 percent of greenhouse gas emissions worldwide.

The Environmental Protection Agency concluded that in 2007, only 2.8 percent of U.S. greenhouse gas emissions came from animal agriculture.

Livestock production systems in the United States differ notably from livestock practices worldwide in genetic selection, feeding practices and other technologies. Assigning a percentage of global emissions to the U.S. system is misleading because the vast majority of global greenhouse gas emissions attributed to livestock production result from deforestation and the conversion of rain forests and other lands to crop or pasture land, which does not occur in the United States.

Since 1990, greenhouse gas emissions from the U.S. animal agriculture industry have remained nearly constant while meat production increased by almost 50 percent, milk production by 16 percent and egg production by almost 33 percent. Today's American farmer feeds about 144 people worldwide and often does so by using land that is not tillable or that cannot be used for other non-agrarian practices.

The animal protein sector in the United States is environmentally and socially responsible, and we strive to provide the safest, most abundant and most wholesome product to consumers domestically and worldwide.

J. PATRICK BOYLE
President and Chief Executive
American Meat Institute
Washington

Meat, climate change, and industry tripe

Posted 8:50 AM on 5 Aug 2009
by Tom Philpott
http://www.grist.org/article/2009-08-05-meat-climate-nonsense/

Washington Post food-politics columnist Ezra Klein has taken a stand: people should eat less meat, because of its vast greenhouse gas footprint. To make his case, Ezra cited the FAO's landmark "Livestock's Long Shadow" report, which found that global meat production is responsible for 18 percent of total greenhouse gas emissions.

To be honest, when I read Ezra's column, I thought, "yeah, and?" Of course we should eat less meat. But how far will individual choice take us? Shouldn't we focus on forcing the meat industry to pay up for its massive externalities, including its contribution to climate change? Yet this eat-less-meat plea ended up generating more controversy than I thought possible.

In a letter to the editor published Monday, J. Patrick Boyle, president of the American Meat institute, fired back, declaring Klein's take on meat "inaccurate and not scientifically based." How so? According to Boyle:

The Environmental Protection Agency concluded that in 2007, only 2.8 percent of U.S. greenhouse gas emissions came from animal agriculture.

He concludes: "The animal protein sector in the United States is environmentally and socially responsible, and we strive to provide the safest, most abundant and most wholesome product to consumers domestically and worldwide."

Oh, really?

Boyle is a veteran fighter for the big-meat cause. The AMI lobbies on behalf of meat packers like Tyson, Cargill, and Smithfield. According to his bio, Boyle has led AMI since 1990. He had prepped himself for a career as a top lobbyist the traditional way—by working for the agency he would later lobby. His bio declares:

From 1986-89, Boyle was administrator of the Agricultural Marketing Service (AMS) at the U.S. Department of Agriculture (USDA). At AMS, he oversaw such programs as federal meat grading and the national beef and pork checkoff programs. He was responsible for administering 37 federal statutes affecting food quality, safety, research and marketing of meat, poultry, milk, fruits, vegetables, cotton and tobacco.

Indeed, the AMI is a popular stop for those who swing through the revolving door between government jobs and plumb lobbying positions. Click around its staff page and you'll find plenty of former USDA and Congressional-staff apparatchiks.

So what of Boyle's claim that Klein way overstated the GHG footprint of U.S. meat—that meat, in fact, contributes just 2.8 percent of total U.S. GHG emissions as compared to the FAO's global estimate of 18 percent?

First, it should be noted that Klein and Boyle are talking about different things: Klein used global numbers, while Boyle pointed to strictly U.S. numbers.

And as Ralph Loglisci of The Center for a Livable Future at Johns Hopkins University points out in a recent blog post, the U.S. number will certainly be lower than the global one, for the simple reason that the U.S. spews out so much more greenhouse gases from all sources than the rest of the world.

We're the globe's largest per-capita emitter of greenhouse gas (and a close second to China in overall emissions). Here, the meat industry exists alongside a 211 million-strong fleet of generally low-mileage cars (propped up by a low-functioning mass-transit system), a network of coal-fired power plants that supply half of our electricity, and a built environment characterized by low-density sprawl.

In short, comparing meat's share of greenhouse gas emissions domestically and globally, the denominator—total emissions—is relatively much higher domestically. To use that truism to excuse the carbon footprint of the U.S. meat industry is ridiculous—a form of vulgar relativism. Just because they're surrounded by an abundance of SUVs and coal-fired power plants doesn't make our meat factories any more benign.

Next, it must be acknowledged that the FAO study Klein cites and Boyle's EPA source were measuring different things. As Loglisci points out, the FAO sought to calculate meat's total GHG footprint—not only

methane from cows and nitrous oxide from manure, but also emissions related to growing and hauling feed grains and moving processed meat to market. The EPA numbers cited by Boyle, by contrast, measure only methane from livestock and nitrous oxide from manure. Emissions related to feed are accounted for elsewhere, as is carbon released in the process of ventilating massive confinement houses, and moving meat from production centers like North Carolina and Iowa to far-flung markets.

Perhaps most egregiously of all, Boyle's cherry-picked stat thus wrongly absolves the meat industry from nitrous oxide emissions associated with growing corn—a massive source of greenhouse gas.

How massive? According to the National Corn Growers Association (PDF), 44 percent of U.S. corn becomes domestic animal feed, and another 10 percent ends up in feed rations as the ethanol byproduct distillers grains. That means more than half of U.S. corn—our nation's largest farm crop—ends up on feedlots.

And farmers use more nitrogen fertilizer on corn than any other crop by a wide margin. Using data from the charts on this USDA page, I estimate corn sucks in about 44% of nitrogen fertilizer applied in U.S. agriculture. So based on its reliance on corn, U.S. feedlot agriculture is responsible for nearly a quarter of total U.S. nitrous oxide emissions. And Boyle's number conveniently omits that.

The omission is not trivial. In the agriculture section (PDF) of its "Inventory of U.S. Greenhouse Gas Emissions, 1990-2007," the EPA credits "agriculture soil management"—i.e., nitrous oxide from fertilizer application—with about half of ag-related GHG emissions. And guess what? The EPA may be seriously underestimating here. A 2007 study by the Dutch Nobel laureate Paul Crutzen, an atmospheric chemist, concluded (PDF) that the accepted estimates for how much nitrogen fertilizer ends up in the air as NO2 could be off by a factor of as much as five.

So if Boyle's 2.8% figure is off the mark, what percentage of U.S. greenhouse gas emissions does actually stem from meat production? Loglisci of The Center for a Livable Future says it's hard to pinpoint. "As far as I know, no one has crunched the numbers to determine a comparable GHG emissions number for U.S. livestock," he writes.

Working with a Johns Hopkins researcher, Loglisci compiled some rough numbers and came out with an estimate of about 9%—half of the global FAO number cited by Klein, but three times the figure pushed by Boyle. "And in real numbers, not percentages, U.S. livestock production's GHG contribution could still be the largest in the world," Loglisci writes.

So, yes, Ezra Klein was right—there's a strong case for eating less meat.

Lesson 4B Assessment 1

(Use this rubric if the writing assignment was assigned.)

Aspect	Expert (4)	Practitioner (3)	Apprentice (2)	Novice (1)	Score
Written Report/ Ideas	Paper is clear and focused. It holds the reader's attention.	The writer is beginning to define the topic, even though development is still basic or general.	The paper has no clear sense of purpose or central theme.	The paper did not address the assignment	
Written Report/ Organization	Organization enhances and showcases the central idea. The order, structure or presentation of information is compelling.	Organizational structure is strong enough to move the reader through the text without too much confusion.	Writing lacks a clear sense of direction. Ideas and details seem strung together in a loose or random fashion.	The paper is not organized.	
Written Report/ Voice	Writer speaks directly to the reader in a way that is individual, compelling, and engaging.	Writer seems sincere, but not fully engaged or involved. Writing has discernable purpose, but is not compelling.	Writer seems indifferent to the topic and the content. Writing lacks purpose and audience engagement.	The paper lacks a voice.	
Written Report/ Conventions (spelling, punctuation, capitalization, grammar, usage, paragraphing)	Writer demonstrates a good grasp of standard writing conventions and uses conventions effectively to enhance readability.	Writer shows reasonable control over a limited range of standard writing conventions.	Errors in conventions repeatedly distract the reader and make the text difficult to read.	Conventions are ignored.	
Information Analysis	Both sides of the debate were read and understood. Writing related a strong analysis of both sides.	Both sides of the debate were somewhat understood. Writing analysis is generalized.	Argument not really understood. Writing does not show any analysis.	Little or no attempt at analysis.	
				Total Score	**/20**

Lesson 4B Assessment 2

(Use this rubric if the classroom discussion is chosen.)

Aspect	Expert (4)	Practitioner (3)	Apprentice (2)	Novice (1)	Score
Reading	Reading is thoroughly completed without guidance.	Reading is completed with some guidance.	Reading is partially completed; guidance is needed.	Reading is not attempted.	
Information Analysis	Both sides of the debate were read and understood. Discussion relates a strong analysis of both sides.	Both sides of the debate were somewhat understood. Discussion analysis is generalized.	Argument not really understood. Discussion does not show any analysis.	Little or no attempt at analysis.	
Communication/ Critical Thinking Questions	Clearly communicates subject understanding during class discussion.	Clearly communicates some subject understanding during class discussion.	Communicates minimal subject understanding and needed to be called upon during class discussion.	Shows no subject understanding and did not participate in class discussion.	
				Total Score	**/12**

Objective Check

1. What are the two sides to the meat consumption debate? (Eat less meat because it is good for the environment vs. meat production is cast in a negative light and the statistics related to greenhouse gases are misrepresented.)
2. How did the authors use opinions and facts to support their arguments? (Authors used specific statistics that supported their own argument while ignoring other statistics that did not.)
3. What is your opinion on the meat consumption debate? (Answers will vary.)

Unit 4: Food Quiz

Name:_____

Multiple Choice: Read all possible responses and select the best answer.

1. **Eating organically grown food can reduce greenhouse gas emissions.**
   a. True
   b. False

2. **What is the greatest advantage to the climate (in terms of GHGs) to purchasing locally grown food from a neighborhood farmer's market?**
   a. The food has traveled fewer "food miles."
   b. The money spent stays in the local economy.
   c. There is no advantage.
   d. The food is more nutritious.

3. **Which of the following foods produces the most GHGs?**
   a. Vegetables.
   b. Chicken
   c. Beans
   d. Beef

4. **Which of the following activities decreases the GHG emissions of food consumption?**
   a. Reduce the amount of red meat and dairy you consume.
   b. Decrease food waste.
   c. Eat more unpackaged and unprocessed food.
   d. All of the above.

5. **What is the advantage to eating whole foods when considering greenhouse gas emissions?**
   a. Processing and packaging foods is an energy-intensive practice.
   b. Whole foods are more available in grocery stores.
   c. Whole foods are healthier than processed foods.
   d. Whole foods do not provide any advantage.

6. **How should you cut down on waste from cooking?**
   a. Actually eat leftovers.
   b. Don't cook more than you'll eat.
   c. Recycle packaging from food products.
   d. d. All of the above.

7. **True or False? Food miles are the most effective way to reduce the GHG emissions associated with food.**
   a. True
   b. False

8. **Reducing your GHG emissions means you cannot eat meat.**
   a. True
   b. False

9. **Meat and dairy production has become more efficient in terms of GHG in the past 20 years.**
   a. True
   b. False

10. **Why does eating organic food reduce GHG emissions?**
    a. The food travels fewer miles to get to your plate.
    b. Organic farming methods costs less.
    c. Organic farming results in more carbon sequestration in the soil.
    d. Organic farming is healthier for your body.

Short Answer

11. **Name three steps you can take to reduce your food related emissions:**

    1.
    2.
    3.

12. **Name three sources of greenhouse gas emissions associated with producing food and getting it to your plate:**

    1.
    2.
    3.

Unit 4 Quiz Key

1. a
2. c
3. d
4. d
5. a
6. d
7. b
8. b
9. a
10. c
11. Answers will vary but may include decreasing meat or dairy consumption, eating local, wasting less food, eating organic, eating whole foods.
12. Answers will vary but may include meat or dairy consumption, food mile, food waste, packaged foods, fertilizers.

Food Appendix

The EPA publishes a guide for food service providers to putting surplus food to use at:

http://www.epa.gov/osw/conserve/materials/organics/pubs/food-guide.pdf

This article does a good job laying out the basic facts relating food, "food miles" and production processes to greenhouse gases:

http://news.mongabay.com/2008/0602-ucsc_liaw_food_miles.html

A number of quizzes can be found at National Geographic's Green Guide. There are quizzes on food safety, food crisis, organic food, seasonal fruit, and a number of other important issues: *http://www.thegreenguide.com/quizzes*