Optional Extra Credit Study Questions for The Sustainable Meal Project

1) Why does Pollan claim Americans have a ‘national eating disorder’?
   
   As a culture we tend to be food faddists, allowing our diet to be determined by the latest ‘media storm’. This is due to a lack of ‘deeply rooted traditions surrounding food.’

2) What is the omnivore’s dilemma?
   
   When humans, as omnivores, are faced with a lot of different types of available foods, it becomes complicated to decide which food one should eat.

3) What tends to complicate the omnivore’s dilemma in America?
   
   The huge array of food choices available in the American supermarket.

4) What are four ways in which humans substantially alter their food chains in comparison to nature’s other eaters?
   
   --use of cooking
   --hunting with tools
   --agriculture
   --food preservation

5) Pollan builds his narrative around three different food chains, the industrial, the organic, and the hunter-gatherer. What do these food chains all have in common?
   
   They link us through what we eat to the energy of the sun and the minerals in the soil.

6) Pollan identifies three themes that crop up again and again in his exploration of the three food chains mentioned above. What are these three themes?
   
   --fundamental tension between logic of nature (complexity) and logic of human industry (simplicity);
   --problems of health and nutrition than can be traced back to the farm and farm policies;
   --replacing solar energy with fossil fuel energy.

7) What does Pollan find most troubling about what he calls, ‘industrial eating’?
   
   It obscures all of the relationships and connections we have to the natural world. Forgetting and not knowing is what the industrial food chain is all about.

8) Wendel Berry has stated that “Eating is an agricultural act.” Pollan extends Berry’s idea by suggesting that eating is also an ecological act and a political act, too. What does Pollan mean?
   
   How and what we eat determines to a large extent the use we make of the world and what is to become of it.

9) What is Pollan’s working definition of industrial food?

   “Any food whose provenance is so complex or obscure that it requires expert help to ascertain.”
10) In terms of biodiversity, what great internal contradiction looms in a supermarket?

Even though there is a great variety of food items in the supermarket, many of them can be traced back to a small list of plants dominated by a single species, *Zea mays*.

11) Why is C-4 photosynthesis pivotal to the prominence of corn in American agriculture?

*C-4 photosynthesis*, which allows certain plants like corn to fix more carbon under hot dry conditions than would be possible with ‘normal’ C-3 photosynthesis, accounts for the high crop yields obtained by growing corn.

12) Why does Pollan state that corn has succeeded in domesticating humans?

The co-evolution of humans and domesticated plants like corn represents an evolutionary strategy on the part of the plant as much as a human strategy.

13) What are three ways in which European settlement has impacted the biodiversity of the New World?

--introducing exotic plants that displaced native plants (e.g., replacing prairie grasses with wheat);
--introducing exotic animals that displaced native animals (e.g., replacing bison with cattle);
--introducing exotic microbes (e.g., smallpox, Dutch elm disease)

14) Why does Pollan call corn the ‘protocapitalist’ plant?

The dried seeds are easily commodified and used for trading.

15) What are four traits that evolved in corn that made it a very suitable plant for industrial agriculture?

--upright growth characterized by uniform, stiff stalks that do not fall over before harvest;
--ability to be crowded in the field resulting in increased yields;
--ability to respond to fertilizer with increased growth and yield;
--hybrid vigor results in increased yield (also, hybrid become intellectual property which has value).

16) How has the Naylor farm changed during the course of the twentieth century with respect to crop diversity and mouths fed?

In the early Twentieth Century the farm produced more than a dozen crops and fed about a dozen people. By the end of the century the farm only grows two crops but feeds 129 people.

17) Why doesn’t George Naylor plant genetically modified corn?

He doesn’t feel that the benefits it brings are worth the extra price of the seed. He feels that essentially all of the extra yield resulting from growing genetically modified corn only ends up benefiting the agribusiness companies.

18) What are four ways in which industrial agriculture has impacted the biodiversity, landscape, and demographics of Iowa?

--less crop diversity;
--larger fields;
--less livestock;
--less people.
19) What was the significance of legumes in the traditional mid-west crop rotation scheme?

By their ability to fix atmospheric nitrogen, legumes increased the fertility of the soil by adding nitrogen to it.

20) Why is the Haber-Bosch process considered to be the most important invention of the twentieth century?

By creating a new source of nitrogen, which is a limiting nutrient for world agriculture, it increased the carrying capacity of the earth for the human population. Vaclav Smil estimates two of every five humans on earth today would not be alive without the Haber process.

21) How did the Haber-Bosch process fundamentally change the ecology of the farm?

Before the Haber process all nitrogen used by plants essentially was fixed using the energy of the sun. The Haber process uses fossil fuel energy to fix nitrogen.

22) How were the New Deal corn price support programs that were in place until the 1970’s fundamentally different from today’s programs?

The New Deal programs permitted farmers a hedge against low prices by allowing them to divert their crop to government storage instead of sending it to the market. If prices got too high, the government could stabilize the price for consumers by selling the stored corn on the commodity market. In current programs, farmers get subsidized regardless of market conditions, resulting in overproduction and perpetually low corn prices.

23) Why does George Naylor feel that the free market approach has never, and will never, work in the agriculture?

The free market approach works in manufacturing because a manufacturer can generally increase consumption of her product by lowering prices. If prices fall too low, a manufacturer can simply reduce supply by stopping production and laying off workers until the market catches up. In farming, the market is more inelastic, and lower prices do not necessarily increase consumption. Also, if a farmer ceases production by selling the farm, generally another farmer buys the land and continues production in an attempt to increase her cash flow.

24) How has commodity trading of corn affected its quality?

Since the quality standards of commodity corn are fairly minimal, the only quality that farmers look at is yield.

25) From an ecological loop viewpoint, how does traditional (old-fashioned) livestock management differ from the management that takes place in a modern CAFO?

Traditional livestock management involves a closed ecological loop with respect to crop and animal wastes. Farm animals eat crops (or waste of the crops) grown on the farm, and the animal waste is fed back to the crop as manure to maintain soil fertility. In a modern CAFO, crops are removed from the farm and sent to the CAFO. This export of nutrients off the farm means that chemical fertilizers must be purchased as an input to maintain soil fertility. In addition, animal wastes produced at the CAFO must be disposed in a way that does not create a pollution problem.

26) What are the co-evolutionary relationships in which ruminant grazing animals are involved?

Ruminant bacteria, cows and grass have co-evolved so that cows provide a habitat for ruminant bacteria, which allow cows to consume the otherwise indigestible cellulose of grass. Grass is grazed by a cow, which prevents sun-robbing trees and shrubs from out-competing the grass.
27) Why is *E. coli* O157:H7, the bacterium responsible for the recent spate of spinach-related food poisonings, considered to be a product of the modern CAFO?

*The pH of the rumens of cattle being fed grass is close to neutral. In contrast, the rumens of cattle being fed grain corn become acidic. *E. coli* O157:H7 is an acid-resistant strain of *E. coli* that has evolved in the highly acidic rumens of corn-fed cattle. When humans ingest normal *E. coli*, the bacteria are killed when they encounter the acidic conditions in the human stomach. In contrast, O157:H7, which is not killed in the human stomach because of its acid resistance, can become pathogenic.*

28) In brief, how are the different parts of the corn seed used in food processing?

--yellow skin is used for vitamins and supplements;  
--the germ (embryo) is used for oil;  
--the endosperm is used for starch and other complex carbohydrates.

29) In the food industry what is meant by the term 'fixed stomach'?  

*Each human can eat only so much food, no matter how cheap it gets.*

30) What four advantages of processed foods motivate manufacturers to produce these products in preference to whole foods?

--ability to substitute cheaper ingredients;  
--less vulnerable to supply problems;  
--longer shelf-life;  
--food processor captures more of the food dollar than the farmer.

31) What are four benefits of the ecological symbiosis between birds and herbivores? (Describe two benefits each for bird and herbivore.)

--bird benefits:  
cattle keep grasses short, which allow birds to move through pasture more easily;  
grubs and fly-larvae in cattle pats feed birds;  
--herbivore benefits:  
birds reduce cattle parasite population of pasture;  
birds spread out cattle pats so that nutrients are more quickly recycled to soil.

32) Why does Joel Salatin refer to the soil as the 'earth’s stomach'?

*Microbes and invertebrates in a healthy soil digests the dead organic matter to nourish the living organisms growing in the soil.*

33) What are two phases of the evolutionary symbiosis between humans and grasses?

*During the Age of Perennial Grasses, humans used fire to maintain grassland habitats that supported herbivores that humans hunted.  
During the Age of Annual Grasses, humans cultivated annual grasses like wheat and corn that they could eat directly or feed to livestock.*

34) How do the survival strategies of perennials differ from that of annuals?

*Perennials survive by having a deep root system and by having a ground-hugging crown that in many cases sends out runners. Annuals survive by investing huge amounts of resources into producing seeds.*
35) What does Pollan mean with his use of the term ‘supermarket pastoral’?

*The literary genre used by food marketers on product labels to hype food while obscuring how it is produced.*

36) What is contradictory in the notion of ‘industrial organic’ food production?

*The organic farming movement was established to avoid the pitfalls of industrial farming.*

37) Why has the USDA been historically hostile towards organic agriculture?

*The USDA viewed the principles of organic agriculture as a critique of the industrialized agriculture the USDA was promoting.*

38) What were the basic differences between Justus Von Liebig’s and Sir Albert Howard’s understanding of soil fertility?

*Liebig took a reductionist view of plant nutrition, which assumed that all plants need for growth are inorganic sources of nitrogen, phosphorus, and potassium (NPK). In Liebig’s view inorganic chemicals feed the plant, and the soil is merely a substrate to hold moisture and anchor plants.*

*Howard took a holistic view of plant nutrition, attributing it to the health of the soil microflora, which thrives on soil organic matter and humus. According to Howard, a diverse thriving soil microflora benefits plants in a variety of ways by providing mineral nutrients, improving soil structure, and encouraging symbioses between microbes and plants. In Howard’s view a farmer should feed the soil with organic matter, and the soil will take care of the plant.*

39) What did Sir Albert Howard mean by his use of the term ‘nature’s censors’?

*Howard considered plant pests and diseases as indicators of unsuitable plant varieties and methods of farming inappropriate to the locality.*

40) Sir Albert Howard’s early critics asserted his approach to agriculture was more philosophy than science. Is there scientific evidence to support Howard’s claims? If so, what is the evidence?

*--plants grown with synthetic fertilizer are less nutritious than when grown on composted soil;*  
*--plants grown with synthetic fertilizer are more vulnerable to pests and disease;*  
*--polycultures are more productive and less prone to disease than monocultures;*  
*--civilizations that abuse their soil eventually collapse.*

41) In the struggle over the definition of the word ‘organic’, how did the position of the organic movement differ from that of the organic industry?

*The organic movement sought to retain its original founding principles in the definition of organic, while the organic industry sought to define the word as loosely as possible to make it easier for mainstream companies to get a share of the organic market.*

42) From the point of view of a food distributor like Whole Foods it is more cost-efficient to buy from one thousand-acre farm than ten hundred acre farms. How does production efficiency compare between the two different sizes of farms?

*On a food per acre basis, small farms are more productive than large farms.*
43) What value does the USDA place on the organic label with respect to the nutritional quality of food?

The USDA views the organic label as merely a marketing tool and does not acknowledge any nutritional difference between the two types of food.

44) What scientific evidence exists regarding nutritional differences between fruits and vegetables grown organically compared to those grown conventionally?

Experiments with corn, strawberries, and blackberries have shown that organically-grown crops have higher levels of antioxidants like vitamin C and polyphenolic compounds than their conventionally-grown counterparts.

45) What is meant by the term ‘management intensive grazing (MIG)?’

Managing the grazing of a pasture so that the grasses are kept in their most optimal state of growth, by making sure they are not undergrazed nor overgrazed.

46) How is the sigmoidal growth characteristic of grass exploited by a practitioner of MIG?

When grasses first begin to grow, they grow slowly until the root and leaf areas increase to a point that results in very rapid growth of the plant. If the grasses remain ungrazed, growth slows as the plants start putting resources into stems and flowers rather than more roots and leaves. If the grasses are grazed, they can be kept perpetually in the ‘blaze of growth.’

47) Why is MIG not conducive to industrial agriculture?

MIG requires continual observation of the pasture to track the precise stage of growth of the grasses, and requires a lot of management of the herd. In short, it is labor and thought intensive.

48) How does MIG increase species diversity compared to continuous grazing?

When pastures are continuously grazed, the favorite plants of the grazers end up becoming displaced by the less desirable plant species.

49) According to the Land Institute, a well-managed pasture produces more protein and carbohydrate on a per acre basis than corn. According to Pollan, why doesn’t the government subsidize grass farmers?

--grass farmers buy little pesticides, fertilizers, and oil;
--grass is not a commodity;
--grass cannot be used by food processors;
--grass farming cannot be industrialized. (Tim's note: I disagree with Pollan on this last point, because I am aware of many industrial-sized grass farms in the West that are being subsidized by government supported irrigation projects.)

50) How do the efficiencies of industrial farming and biological farming differ?

The efficiency of industrial farming derives from simplification and size. The efficiency of biological farming derives from complexity and interdependence.