2 | HOW SHOULD WE GROW? COMPARING FOOD SYSTEMS

Summary

This session introduces different approaches to organizing a food system, and provides a framework for defining and evaluating a "sustainable food system." Through the "life stories" of two strawberries, you will view a snapshot of different food systems, and generate traits of a system that nourishes people, the environment, and the economy (a "sustainable" system). You will then review trends on food production, consumption, prices, health, and the environment, and assess the implications of the trends. By the end of the session, learners will have a framework for evaluating food systems that will be applied throughout the rest of the curriculum.

Guiding Questions

- What are different ways to organize a food system? What are the similarities and differences in terms of approaches and outcomes?
- What are key trends in food production and consumption? What do these trends tell us about the U.S. food system?

Activities

1) A Tale of Two Strawberries (two-part poem)

2) Defining Possibilities for Sustainable Food Systems (discussion/presentation)

3) Where Are We Headed? (group activity)

4) Before the next session (to complete on your own): Brainstorm the path your last meal took from farm to your table.

Activity 1) A Tale of Two Strawberries

You will work with a partner. One person will work with Strawberry A, the other with Strawberry B.

Directions

1. The facilitator will assign two people to read the poem below, while others are listening. The poem tells the story of two different strawberries. Begin with Line A1, continue with B1 and so on, alternating voices. Illustrations for the two stories appear on the next page. Review these pictures as the poem is read. The poem is read from the perspective of two strawberries. Once the poem is read, move onto step two in these directions.

2. Find the map on the page after the strawberry pictures. On the map, write down the geographic locations(s) involved in the different stages of your strawberry's life. For example, if you have strawberry A, write "grown here" on California, since this is where it was grown. Partners can write on the same map, but with a different color. (Use the numbers on the pictures as short-hand if desired.)

3. Next, find the Venn diagram under the map. Work with your partner to write down the similarities and differences between the two strawberries. Review the poem and the pictures as a guide. Consider at least three of the following aspects in your comparison, and mark them on your diagram:

    - farming/production/growth
    - transportation and processing
    - consumption and disposal
    - relationships between the people producing the food (farmers, farm workers, factory workers) and the consumers in each system
    - human-environmental relationships
    - needs and goals served in each system

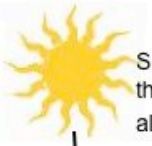
4. After you are done with the above activities, respond to the following questions in a whole group discussion as directed by the facilitator:

    - What aspects of the strawberries' lives did you already know about? What were new?
    - In what ways are the strawberries' lives most similar? How are they most different?
    - How is the community and environment impacted differently in each one?
    - What needs and goals were served in each system?
    - Describe the relationship between the people producing the food (farmers, farm workers, factory workers) and the consumers in each system.
    - What other foods can you think of that could have different stories such as these?

A Tale of Two Strawberries

Strawberry A	Strawberry B
A1) I was born in sunny California, the U.S.'s number 1 producer of strawberries.	B1) I was born at a farm near you.
My farm is large--over 400 acres.	My farm is small--less than 50 acres.
My farm produces 3-6 crops, almost all year round.	My farm produces 1-2 crops, mainly in spring and summer.
My farm uses machinery that reduces the need for human labor, although we need workers year round.	My farm uses some machinery but requires many human laborers when we're planted, weeded, and harvested.
I grew up with thousands of other strawberries just like me.	I grew up in a diverse field, with plants that provided habitats for our insect neighbors.
My field was bordered with grasses along drainage ditches to catch excess run-off and create a habitat for other creatures. Our run-off had fertilizers and pesticides.	My field was bordered with grasses along drainage ditches to catch excess run-off and create a habitat for other creatures. Our run-off was mostly water and some soil nutrients.
I was grown in a raised bed, good for drainage and harvesting.	I was grown in a raised bed, good for drainage and harvesting.
My bed was lined with plastic from Utah and fumigated to control weeds and disease.	My bed was mulched with local mulch to control weeds and disease.
I was fed synthetic fertilizer, manufactured with lots of fossil fuels and shipped from Hungary.	I was fed with nutrients from the soil, compost, and nitrogen from cover crops.
We had some unwelcome neighbors, like strawberry weevils.	We had some unwelcome neighbors, like strawberry weevils.
My farmer applied insecticides from Texas to make the weevils die.	My farmer introduced "trap crops" like alfalfa to attract the weevils, then damsel bugs and lacewings to eat them.
My farm hired a waste management company to remove farm "waste" that may have gone to a landfill.	My farm composts its "waste" to use as soil fertilizer for next season's growing.
I was tended and harvested by seasonal migrant workers from Mexico, Ecuador, South America, and other countries.	I was tended and harvested by the farm family, seasonal migrant workers, and nearby families who enjoy U-pick farms. Some workers traveled from Mexico and other countries.
These workers labored almost year round, 10-12 hours a day, and often earned less than $7 per hour.	These workers worked mostly April through October, 6-8 hours a day, and earned a living wage.
These workers are exposed to intense levels of chemicals and excessive heat and sun.	These workers were protected from intense levels of chemicals and overexposure to heat and sun.
I was picked before I was ripe to withstand national distribution.	I was picked at the peak of ripeness for regional distribution.
I wasn't as flavorful or nutritious as I would have been if harvested when ripe..	I was full of flavor and nutrition.
I rode 1000 miles in large refrigerated trucks.	I rode 200 miles in a small refrigerated truck.
I traveled to wholesale operations, supermarket chains, restaurants, hotels, processing factories, and food coops.	I traveled to local markets, grocery stores, bakeries, local restaurants, and food co-ops.
If I become soggy and brown, I'm tossed in the trash receptacle. I'm not quite sure what happened to that crate that I arrived here in.	If I become soggy and brown, I'm tossed on a compost pile, where I meet fruits, coffee grinds, and egg shells.
A garbage truck takes me a landfill in another state.	Microbes turn me into compost.
There are many seagulls flying around my head.	I await the birth of future seasons of strawberries.

Strawberry A



Sun provides the source of all energy.

Strawberries are grown on a large farm in California. (400 acres)

Migrant workers traveling from Mexico-working 10-12 hour days.

Plastic lining shipped from Utah.

Synthetic fertilizers shipped from Hungary.

Insecticides shipped from Texas.

Packaged in clam-shell containers shipped from Taiwan.

Strawberries are picked before they have ripened. (3-6 crops)

Refrigerated truck driven over 3,000 miles.

Waste from stores, farm, and materials distribution venues ends up in landfills in CA and all over the U.S.

Distribution to supermarkets , food co-ops, factories, chain restaurants, hotels all over the U.S.

Strawberry B

Sun provides the source of all energy.

Grown on local farm, with other crops. (50 acres)

Organic mulch and green manure compost fertilizer from the farm, mulch from farm one town over.

Workers travel from community, state, and Mexico. All workers are paid a living wage and work 6-8 hours a day. Customers pick, too.

Packaged in small baskets shipped from a factory 85 miles north in the same state.

Strawberries are picked when ripe. (1-2 crops)

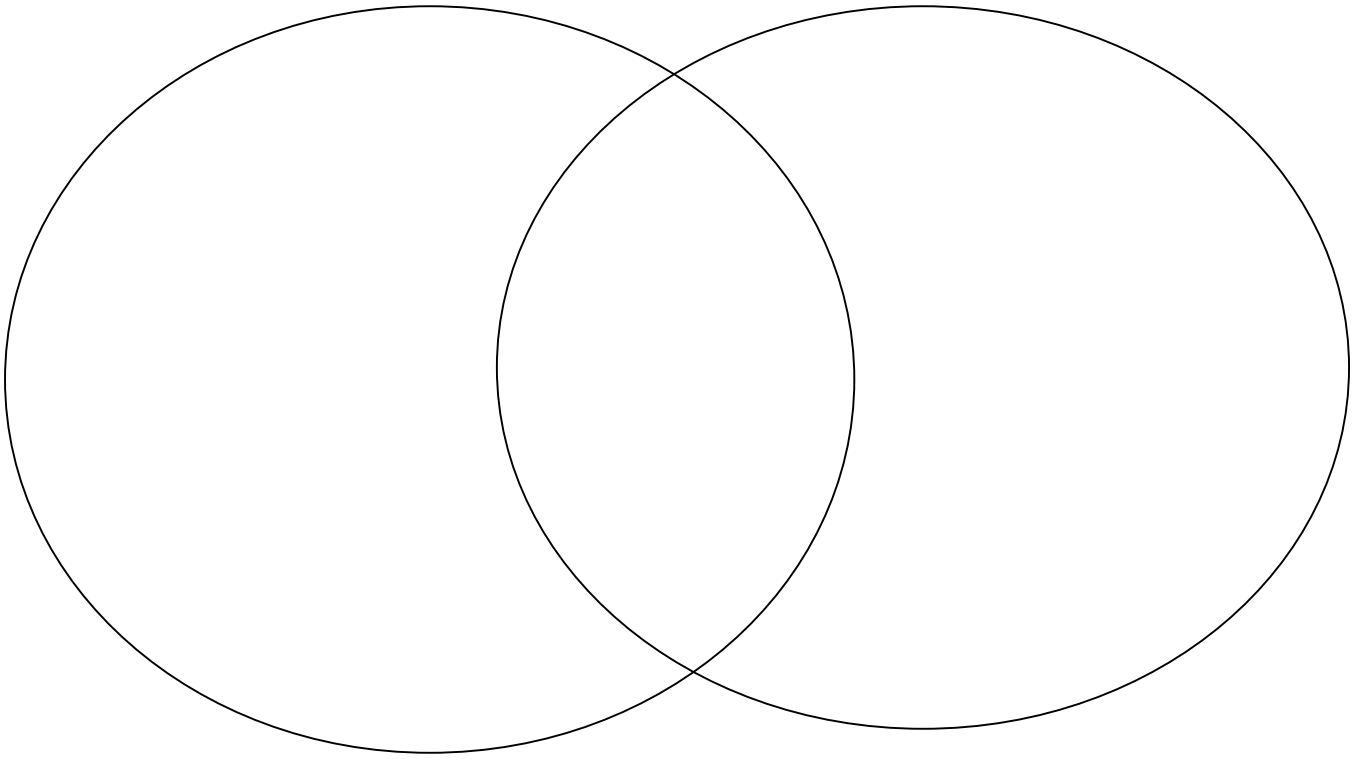
Farm wastes are composted for next season's fertilizer.

Small refrigerated delivery truck driven 200 miles.

Distribution to local markets, groceries, bakeries, local restaurants, and food co-ops within days of being picked.

Map: Use different color pens/pencils to mark the location of the steps of each strawberry.

Next, record similarities and differences in the strawberries. Consider location, production processes, transportation, energy usage, etc.



Activity 2) Defining Possibilities For Sustainable Food Systems

Introduction: *How can we create a food system that maintains health, sustains the environment, preserves our cultural fabric, and benefits the regional economy?* Such a food system would comprise a "sustainable food system." But what might this really look like? What criteria would it reflect?

Directions: Consider the following set of traits or "design principles" for the system. As you review the traits, consider which are new, and which you were already familiar with.

Maintains health

- Food is recognized by people as an essential element of personal, ecological/environmental, and community health.
- The system makes available healthy and nutritious foods in ways that maintain health of all elements of the system (people, animals, environment, communities, institutions).
- Supports "food security": access by all people at all time to enough nutritious food for an active, healthy life (FAO, 2001).
- Connections between human and environmental health are recognized and respected.

Sustains the environment

- "Wastes" become nutrients and regenerative inputs for other parts of the system (ex: compost "feeds" the soil; packaging is reused or recycled).
- Polluting wastes are minimized or eliminated.
- Utilizes the benefits of ecological systems and principles: seasonality, cycles, diversity, communities, relationships, interdependence, and limited competition.
- Health is enhanced or protected.
- The ability of ecosystems to regenerate is preserved (soils and aquifers can replenish; the ability of wetlands to filter water is not degraded).
- Builds positive relationships between people and non-human elements in the system.

Preserves cultural fabric

- Supports regional identity through local foods and related agricultural heritage and culinary traditions.
- New and already existing positive, healthy traditions are embraced based on contributions to community wellbeing.
- Builds positive relationships between producers and consumers and recognizes that people are both producers and consumers at the same time.
- Family farms and community-supported businesses can thrive.

Benefits the regional economy

- There are mutually beneficial exchanges among multiple sectors of the economy.
- There is equitable access to land, tools, and other productive materials.
- Trade is fair and benefits all involved.
- Choices and opportunities are provided for producers and consumers.
- Hard work and quality products are valued.
- Takes into account and honors and respects the benefits and services provided by natural systems.

Questions

- What other traits would you add to the list above? How are the traits in each category related?
- Review the community trends you've identified it thus far. In what ways do these trends reflect the traits above? What are areas for improvement?

Sustainability: Assessing systems, not isolated practices

Further clarification about defining a "sustainable food system"

The traits on the previous page represent a set of values that collectively define a possible "sustainable food system." The range of traits presented reflect the idea that a sustainable food system is not a single practice or approach (such as "organic" or "local"); sustainability is more than just where and how the food was grown. **Rather, sustainability is a lens-- a set of conditions, values, and assumptions--to assess the interactions among the system's elements: people, animals, the environment, the community, the economy and institutions.** Interdependence, well-being and renewal are the foundational concepts, and inform the following assumptions about what makes a system sustainable:

- The elements of a food system (people, animals, insects, the environment, economic institutions, communities) are interdependent.
- To be healthy and "sustaining," the elements of the system must work together.
- Ecological principles serve as design guidelines.

A "sustainable food system" is not a static condition; rather, the individual elements evolve and change, impacting the overall systems. Progress towards sustainability can be incremental. For example, a large grocery store that begins to purchase apples from a regional farmer is affecting change in the distribution and sales portions of the system. A consumer who purchases these apples is utilizing their buying power to make change.

Because sustainability involves many elements, terms such as "organic" and "local" cannot be used as the sole measurement of what makes a particular food "sustainable." For example, an "organic" apple that is transported thousands of miles consumes fossil fuels for energy--perhaps more than a locally-produced "non organic" apple that uses modest amounts of fertilizers. Thus, assessing how "sustainable" a food or practice is requires examining it within the context of the overall system.

A working definition

Given its complexity, there is no simple or definitive definition of sustainability. However, the following definition captures many of the traits presented thus far:

> A sustainable food system is "a collaborative network that integrates food production, processing, distribution, consumption and waste management in order to enhance the environmental, economic and social health of a particular place." (University of California Davis, 2008).

What about "other" types of food systems?

Just as there is no simple or clear definition of what makes a "sustainable" food system, there is also no simple way to describe "other" types of systems. For example, people use the terms "industrial" or "conventional" agriculture to describe practices perceived to be "less than" sustainable--for example, a monoculture farm that grows a single crop and ships it thousands of miles. But what if the crop was grown with practices that conserved soil fertility? What if the food was shipped by a truck that used biodiesel? Applying a blanket term such as "industrial" thus fails to consider the pros and cons of all the elements of the system.

To address the complexities of sustainability, this curriculum examines multiple aspects of the food system, enabling learners to develop their own understanding of what makes a "sustainable food system."

Activity 3) Where Are We Headed?

Introduction

Today, the world produces more than enough food to feed everyone, but there are 800 million who go hungry--and yet more who are overweight. Massive inputs of fuel and fertilizer have tripled grain yields since the 1950s, but with a high environmental cost. Grocery store shelves are filled with more and more varieties of processed foods, yet biodiversity continues to decline. What do we make of these trends? And what alternatives are there? In this activity, you will review trends and facts on a variety of topics to determine if or how the U.S. and the world are moving towards a sustainable food system--one that maintains health, sustains the environment, preserves our cultural fabric, and benefits the regional economy.

Directions

1. On the following pages are sets of trends and facts about the national and global food system, organized by topic. Select a set of trends to review, and find that page.

   Set A) National and global trends in food production and consumption

   Set B) National and global trends in nourishment and hunger

   Set C) National and global trends in fertilizer and energy use, and the environmental impacts

   Set D) National and global trends in food prices for consumers and producers

   Set E) National and global trends in trade policies and workers' rights

   Set F) Trends in US farming

2. Read and review all the facts/trends in your topic, and select 2-4 facts or trends that seem significant to you in some way. For example, you might choose items that echo your experience, are new or surprising, or that seem contradictory. In your group, discuss why you selected the trend and what was new, significant or surprising.

3. Summarize each fact or trend you selected on a separate piece of paper (one item per page). Write to fill up the page. You will then place your trends on the wall spectrum. Be ready to present on: 1) why you selected the specific items, and 2) why you placed the items where you did.

moving away from a sustainable food system	not sure/mixed	moving toward a sustainable food system

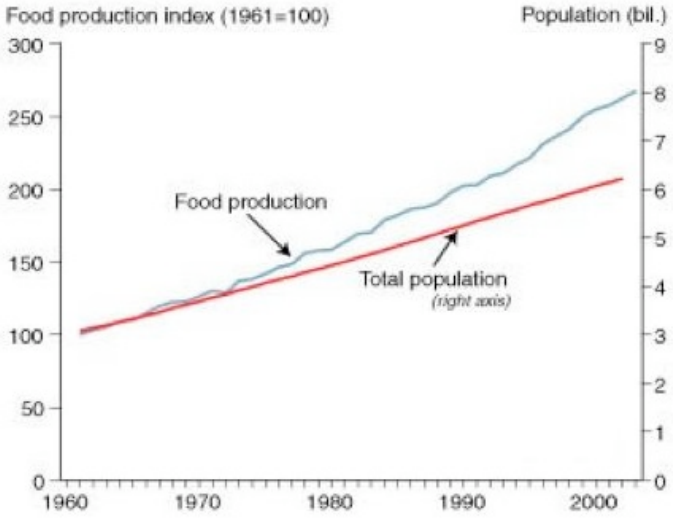
4. When everyone has presented their information, discuss the following questions:

- What overall picture does this data describe?
- In what ways are the different trends related?
- Review your community trends. How do they compare with the ones presented here?
- What trends do you think most need to be changed in order to promote a more sustainable food system?

Set A) National and global trends in food production and consumption

1) The world produces more than 3,800 calories per person per day, more than what an overly active person would need to fulfill their needs (Stiefel, 1998).

2) Since 1960, global food production has increased by 2.5 times, and world population has doubled (Graph source: United States Department of Agriculture (USDA) Economic Research Service (ERS), based on FAO data, 2001).



3) 90% of the world's food is derived from just 15 plant and 8 animal species. Wheat, rice, maize (corn), millet, and sorghum provide 50-70% of the food calories (Halweil, 2008)

4) People consume a little less than half (48%) of the world's grain directly—as steamed rice, bread, tortillas, or millet cakes, for instance. Roughly one third (35%) becomes livestock feed, and a growing share, 17%, is used to make ethanol and other fuels (Halweil, 2008).

5) Fruits, vegetables and other foods from all parts of the world are available year round to consumers who can afford them. Crops indigenous to a particular region are now eaten all over the world. Ex: Potatoes ('new world' food) are a staple in Europe. Coffee (an 'old world' food) is consumed in most parts of the world. High fructose corn syrup (HFCS), made from corn (a new world crop) is a key ingredient in many processed foods (Millstone & Lang, 2003).

6) Increasing price of oil and other fossil fuels, key ingredients in synthetic fertilizers and pesticides, has contributed to a dramatic increase in food prices around the world over the last several years. By April 2008, wheat prices were up 120%, and rice prices were up 75% (Mitchell, 2008).

Set B) National and global trends in nourishment and hunger

1) **Number of hungry people:** More than 842 million people are chronically hungry, most of them in rural areas of poor countries. 524 million of the world's hungry live in South Asia, and 60% of chronically hungry people, are women. The number of chronically hungry people worldwide is growing by an average of four million per year. This is projected to continue if current trends continue (The State of Food Insecurity in the World 2006 Report, 2006).

2) **Percentage of people dependent on agriculture:** Over 70% of the global poor live in rural areas and many depend on agriculture as their primary source of income (Davis, 2007).

3) **Life Expectancy:** In the US, life expectancy for a baby born in 1924 was 57.1 years. A baby born in 2004 can expect to live 77.8 years. This dramatic increase is due in part to improved diets and better medical care. (Arias, 2002)

4) **Obesity:** Among US adults aged 20–74 years, the prevalence of obesity increased from 15.0% (in the 1976–1980 survey) to 32.9% (in the 2003–2004 survey) and the rate of childhood obesity has tripled (Overweight and Obesity, 2008).

5) **Over-nutrition:** In the year 2000, the number of people who are overweight (one billion) had officially surpassed the number suffering from malnutrition (800 million). India and China are seeing an increase in heart disease and diabetes as people with rising incomes eat more meat and processed foods (Food and Agriculture Organization United Nations, 2006).

6) **Increase in Food Banks:** In 1967 the first food bank opened in the United States. A food bank is a non-profit organization that works to distribute food to diverse agencies and organizations (soup kitchens, pantries, shelters) involved in local emergency food programs. Almost all of these agencies report increase in services since 2001. Currently over 4.5 million different people living in the U.S. receive emergency food assistance from America's Second Harvest system in any given week. In Michigan, 34% of the members of households served (includes over 1 million people) by the America's Second Harvest National Network are children under 18 years old, 12% of those served are homeless, 64% are female, 10% are elderly citizens. In Washtenaw county, as many as 50% more people sought food assistance from Food Gatherers' community partners in 2007 than in 2006 (Hunger Facts, 2003-2008).

Set C) National and global trends in fertilizer and energy use, and the environmental impacts

Fertilizers and energy use:

1) Global production of synthetic nitrogen fertilizer has increased from 10 million tons in 1960 to over 800 million tons in 2005. The U.S. alone consumed over 10 million tons (FAO, 2009).

2) Scientists have documented a large "dead zone" of the Gulf of Mexico, with oxygen levels too low to support most aquatic species (< 2mg/l). Scientists have identified agricultural fertilizer run-off as a primary culprit behind the phenomenon (National Oceanic and Atmospheric Administration, 2000).

3) In the U.S. average bite of food travels 1300 miles. By some estimates, one-fifth of US petroleum consumption goes to producing and transporting our food (Smil, 2001; Schlosser, 2001).

4) Altogether today's U.S. food system uses about ten calories of fossil-fuel energy for every calorie of food energy it produces. By some estimates, post-production (processing, packaging, transportation, storage, and retail) accounts for 80-90% of the food system's fuel usage, storage, distribution, and processing (Heller& Keoleian, 2000).

Pesticide applications and pest resistance:

5) Between 1964 and 2004, pesticide applications in the US more than doubled, growing from 215 million pounds to over 494 million pounds. As shown by the table below, usage peaked in 1997, after a decline from 1982-1991.

Year	1964	1971	1982	1991	1997	2004
Million (pounds)	215	364.4	572	477.5	579.3	494.5

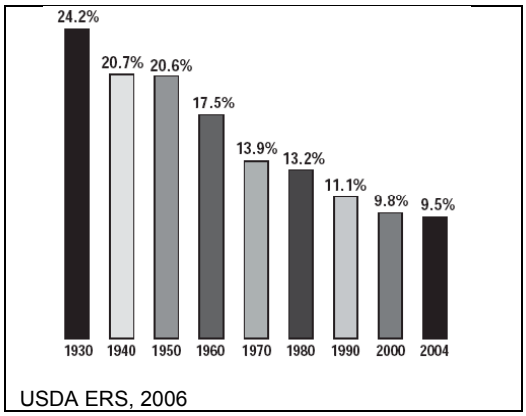
(USDA ERS, 2005)

6) There are now over 500 species of insects and mites resistant to pesticides, up from a handful 50 years ago. More and more pest species are becoming resistant to pesticides at an increasing rate (Bellinger, 1996).

Set D) National and global trends in food prices for consumers producers

1) Percentage of U.S. consumer income spent on food: 1930-2004: Between 1930 and 2004, the percentage of an average consumer's income spent on food has decreased from 24.2% to 9.5% (However, the percent of household income spent on food by people on fixed incomes (the elderly, etc.), or by low income people, is disproportionately higher.) (USDA ERS, 2006).

2) U.S. consumers spend less of their income on food than consumers in most other countries (USDA ERS, 2006).



USDA ERS, 2006

3) Increase in food prices: From 2005-2008, the price of corn in the United States more than doubled, rising from $2.12 to $4.28 a bushel. The increase is driven partly by increased energy prices and demand for alternative fuels such as ethanol. This has resulted in higher prices for foods containing corn (including foods made with corn-based high fructose corn syrup), as well as meat from animals fed on corn (World Bank, 2008).

4) Increasing price of oil and other fossil fuels, key ingredients in synthetic fertilizers and pesticides, has contributed to a dramatic increase in food prices around the world. From 2007 to 2008, wheat prices were up 120%, and rice prices were up 75%. In Bangladesh, a two-kilogram bag of rice consumed about half of the daily income of a poor family (World Bank, 2008).

5) In a report on global agriculture through 2017, the United Nations issued a report that predicts prices for farm crops will remain substantially higher over the next decade, though they will gradually decline from current highs. Biofuel production should account for about a third of the expected increases in prices for vegetable oils and grains (Organization for Economic Cooperation and Development, 2008).

Share of food prices that go to US farmers

6) The table shows the average percentage of the price of different foods that goes to the farmer. The remaining money goes to marketing-related activities, including packaging, advertising, transportation, and the labor used by assemblers, manufacturers, wholesalers, retailers, and eating places. For a highly processed food with many ingredients (such as cereal), the percent going to the farmer tends to be lower.

	Price	Farm Share	Percent
Bread (1 lb. loaf)	$2.49	$.11	4%
Bacon (lb)	3.29	.53	16
Potato Chips (13.5 oz.)	3.49	.08	2
Milk (gallon)	3.99	1.79	45
Cereal (18 oz. box)	5.05	.08	2
Top Sirloin Steak	7.99	.90	11
Fresh Carrots (2 lb.)	1.89	.43	23
Eggs (dozen)	3.19	.95	30
Lettuce (head)	1.74	.33	19

Source: USDA, NASS, Agricultural Prices, 2006

Farmer income

7) The average farm operator's household income for 2007 is estimated at $83,622 (USDA ERS, 2008). However, only 13% of this comes from the farm (Hoppe, et al, 2007).

Set E) Global trends in trade policies and workers' rights

1) **Migrant workers:** There is no precise or reliable number of farm workers, in part because information on farm workers as a distinct population is not available through the U.S. Census. However, several studies offer these figures for 2000 (United States Department of Labor, 2002; Bean et al 2002).
   - There were over 2.5 million year-round and seasonal "migrant" farm workers in the United States. 75% of the workers were born in Mexico.
   - Before 1994, just 7% of the 900,000 migrant farm workers employed in the U.S. at that time were undocumented. By 2000, half of the two million migrant farmer workers in the U.S. were undocumented.

2) **Farmer suicide, international trade policy, and genetically modified organisms (GMOs):** In India in the late 1990's, both trade liberalization and international pressure to employ the use of hybrid GMO seeds for cotton farming resulted in large numbers of farmer suicide. These hybrid seeds, bought on credit from international corporations, put farmers in deep in debt, and were found to be highly vulnerable to pests, and required an increased application of pesticides. After many of these crops failed, over 400 Indian cotton farmers committed suicide (Shiva, 2000).

3) **North American Free Trade Agreement (NAFTA) and its affects on Mexican farmers**: The passage of NAFTA in 1994 reduced and then eliminated government subsidies for Mexican corn farmers. At the same time, U.S. farmers have continued to receive heavy government subsidies for their corn. This has made US corn artificially inexpensive, contributing to the importation of corn by the Mexican government. This "dumping" (flooding the market with subsidized crops) has forced many Mexican corn farmers to abandon growing for the local markets, and forced 1.7 million farmers from their land. As of 2000, U.S. corn imports comprised 25% of Mexican corn consumption, up from just 2% before NAFTA (Kraul, 2000; Ahn, et al, 2004).

4) **Migrant worker children and education:** Farm work often requires continuous relocation. 66% of migrant workers with children bring their children with them as they travel for seasonal work. Frequent relocation makes it hard for these children to get appropriate medical care and education. Only 55 % of children of farm workers graduate high school (National Center for Farmworker Health (NCFH),2007).

5) **Migrant worker children and health:** Child care prices and access can keep children in the fields even when they are not workers. The Health Care Access for Farmworker Children conducted a study in New York and found that of the children surveyed, 43% were working in fields where fertilizers were still wet . Health workers caution that this can lead to long term health problems such as asthma and intestinal parasites. Female migrant workers who are pregnant can be at risk of spontaneous abortion, abnormal postnatal development, fetal malformation, and more (NCFH, 2007).

6) **Worker Safety in agricultural and food industry:** The United State's National Safety Council's 2005-2006 publication, "Injury Facts," ranks agriculture as the nation's most dangerous industry with 29.2 deaths for every 100,000 workers. Every day, about 243 agricultural workers suffer lost-work-time-injuries, and about 5% of these result in permanent impairment (NCFH , 2008).

7) **Increase in Unionization and Worker's Rights**: The Farm Labor Organizing Committee (FLOC) and United Farm Workers are among the labor and human rights organizations that have worked for farm workers' rights for decades. Major victories have raised workers' wages, improved living conditions and worker safety. These organizations continue to organize workers as well as campaign for broader human rights for immigrants (FLOC, 2008).

Set F) Trends in US farming

1) **Farm number and size**: Since the 1940s, there has been a trend toward fewer, but bigger farms, which produce a fewer number of crops (commodities). Despite the growth in size, most U.S. farms—98% as of 2004—are family farms, ranging in size from "small" to large family corporations (USDA, 2006).

Year	# of farms in US	Average size	Ave # of commodities
1946	5.9 million	195 acres	4.6
1975	2.9	376	2.7
2002 (most recent available)	2.1	441	1.3

2) **Growth in farmer's markets:** According to the USDA the number of Farmer's Markets has increased almost 19% since 1994 (USDA, 2008).

3) **Growth in organic:** Organic foods are one of the fasting-rising sectors in food industry. Between 1992 and1997 the cropland used for organic agriculture doubled. From 1997 to 2005 the U.S. organic food industry increased almost 2%. Organic food industries sales are expected to exceed 13 billion in 2008 (U.S. Organic Industry Overview, 2006).

4) **Average number of people fed by one farmer:**
   - In 1900, one farmer could feed 9 people.
   - In 2006, the average farmer could feed 130 people. This reflects an increase in mechanization and high-yield crop varieties (USDA Agriculture Research Service (ARS), 2007).

5) **Consolidation in the meat production industry:** In the US, the meat production industry--including animal feeding, slaughter, and packing--is concentrated in the hands of a small number of corporations; Cargill ConAgra, Tyson are among the dominant players. In the hog industry, for example, the number of farms declined by over 90% between 1970 and 1997 even as overall pork production expanded dramatically (Heffernan & Hendrickson, 2002).

6) **Consolidation in the meatpacking industry:** By 1996, three companies controlled almost 80% of cattle slaughter and by 2002, four companies controlled 64% of pork packing (Molnar et al 1996; Hendrickson & Heffernan, 2002). These large corporations are among the top buyers of commodities for animal feed, particularly corn and soy, which account 83-91% of the ingredients in most animal feed (USDA, 2006). This consolidation contrasts with ownership of farms that produce commodity crops such as corn and soy; most of these farms are still family operations.

7) **Consolidation in the seed industry:** As of 1999, 4 firms controlled 67% of seed corn and 87% of cotton seed. Overall the changes have resulted in mechanized processes, increased use of hybrid varieties, and less control of production by individual farmers (King, 2001).

8) **Genetically Engineered (GE) crops:** U.S. farmers have rapidly adopted genetically engineered (GE) crops since their introduction in 1996. Soybeans and cotton with herbicide-tolerant (HT) traits have been the most widely and rapidly adopted GE crops in the U.S., followed by insect-resistant cotton and corn. Off all acres planted with soybeans, the percent planted with HT crops rose from less than 20% in 1996 to over 90% in 2008. With corn, the percentage of acres planted with HT varieties rose from nearly 0% to almost 60% by 2008 (USDA, 2008).

4) Before the next session

Choose one food from you last meal: _____

On its way to your table, your food experienced some or all of these stages: Growth and harvest, transportation, processing, consumption, and disposal. Brainstorm a list of some of the materials, energy, and labor used to at each stage. Then, try to identify some of the wastes that occurred at all stage.

References for Session 2: *How Should We Grow? Comparing Food Systems*

Ahn,C., Moore, M &., Parkert, N. (2004, Spring). Migrant Farmworkers: America's new plantation workers. *Food First Institute for Food and Development Policy BACKGROUNDER 10,* number 2. Retrieved http://www.nfwm.org/pdf/newsarticles/backgrndfd1st.pdf

Arias, E. (2000). United States life tables. *National Vital Statistics Reports; vol 51 no. 3*. Hyattsville Maryland: National Center for Health Statistics, 2002. Table 12. Retrieved April 18, 2008 from …..web site: http://garnet.acns.fsu.edu/~tchapin/urp5261/exercise/US%20Life%20Tables%202000.pdf

Bean, F. D., Van Hook,J. & Woodrow-Lafield, K. (2002). Estimates of Numbers of Unauthorized Migrants Residing in the United States: The Total, Mexican, and Non-Mexican Central American Unauthorized Populations in Mid-2002. A Study conducted for the Pew Hispanic Center, Washington, D.C.

Bellinger, R.G. (1996). Pest resistance to Pesticides [Electronic version]. Department of Entomology, Clemson University. Retrieved January1, 2004 from http://entweb.clemson.edu/pesticid/Issues/pestrest.pdf

CS Mott Group for Sustainable Agriculture at Michigan State University: http://www.mottgroup.msu.edu/AboutUsMission/DispersingAnimals/tabid/883/Default.aspx

Davis, C. (2007, May 5). April 2007 Monthly Update: Agricultural Trade Reform and Poverty in the Developing World. World Resources Institute. Retrieved June 16, 2008, from http://earthtrends.wri.org/updates/node/194

Dimitrit, G. & Greene, K. (2002). Recent Growth Patterns in the U.S. Organic Foods Market. United States Department of Agriculture Economic Research Service. Retrieved February 17, 2008, from http://www.ers.usda.gov/publications/aib777/aib777.pdf

Farm Labor Organizing Committee. (2008). FLOC and NCGA Renew Labor Contract. Retrieved July 26, 2008, from http://www.floc.com/documents/FLOC%20Renews%20Contract.pdf

Farm Labor Organizing Committee. (2008).Tobacco Workers Suffer in the Fields. Retrieved July 25, 2008, from http://www.floc.com/RJR%20Campaign.htm

Food and Agriculture Organization of the United Nations. (2001). Integrating Food Security Issues into Agricultural Research. http://www.fao.org/docrep/003/y2455e/y2455e03.htm

Food and Agriculture Organization of the United Nations. (2006). The double burden of malnutrition. Retrieved February 16, 2008, from http://www.fao.org/docrep/009/a0442e/a0442e0g.htm

King, J. L. (2001, March). Concentration and Technology, in Agricultural Input Industries. United states Department of Agriculture. Agriculture Information Bulletin 763.

Kraul, C. (2000). Growing troubles in Mexico. Los Angeles Times, Jan. 17, 2000.

Halweil, B. (2008). Grain Harvest Sets Record, But Supplies Still Tight. WorldWatch Institute. Retrieved May 24, 2008 from http://www.worldwatch.org/node/5539

Heller, M.C. & Keoleian, G. (2000). Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System. University of Michigan – Center for Sustainable Systems. Retrieved February 14, 2008, from http://css.snre.umich.edu/css_doc/CSS00-04.pdf

Heffernan, W., Hendrickson, M. (2002). Multi-national Concentrated Food Processing and Marketing Systems and the Farm Crisis. Annual Meeting of the American Association for the Advancement of Science, Boston.

Hendrickson, M. and W. Heffernan (2002). Concentration of Agricultural Markets. Department of Rural Sociology, University of Missouri: 4 pp. GDAE Working Paper No. 04-02: The Paradox of Agricultural Subsidies

Hoppe, R.A., Korb,P., O'Donoghue, E.J. and Banker, D. (2007, June). Structure and Finances of U.S. Farms: Family Farm Report, 2007. United States Department of Agriculture Economic Research Services Economic Information Bulletin No.EIB-24. Retrieved May 23, 2008, from http://www.ers.usda.gov/Publications/EIB24/

Hunger Facts (2003-2008). Food Gathers. Retrieved June 29, 2008, from http://www.foodgatherers.org/hunger_facts.htm

Mitchell, D. (2008, July). A Note on Rising Food Prices (Policy research working paper 4682). The World Bank. Retrieved April 28, 2008, from http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2008/07/28/000020439_20080728103002/Rendered/INDEX/WP4682.txt

Molnar, J., T. Hoban, J.D. Parish, & M. Futreal (1996). Industrialization of Agriculture: Trends, Spatial Patterns, and Implications for Field-level Application by the Natural Resource Conservation Service. Social Sciences Institute. Technical Report Release 5.1. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, Social Science Institute, Greensboro, NC.

National Center for Farmworker Health. (2008). Maternal and Child Health Fact Sheet. Retrieved July 17, 2008, from http://www.ncfh.org/docs/fs-MATERNAL%20FACT%20SHEET.pdf 30-31

National Center for Farmworker Health. (2008, March/April). *Migrant Health Newsline, 25*, Number 2. Retrieved July 29, 2008 from http://ncfh.org/newsline/08-0304.pdf

The National Oceanic and Atmospheric Administration (NOAA). (2000). Hypoxia in the Gulf of Mexico. Retrieved February 21, 2008, from http://oceanservice.noaa.gov/products/pubs_hypox.html#Topic5

Ontario Ministry of Tourism. (2007, August 27).U.S. Travel Market: Participating in Agro-Tourism While on Trips of One or More Nights. Retrieved May 4, 2008, from http://www.tourism.gov.on.ca/english/research/travel_activities/agro.htm

Organization for Economic Cooperation and Development. (date) OECD-FAO Agricultural Outlook: 2008-2017. Retrieved May 17, 2008, from http://www.oecd.org/document/32/0,3343,en_36774715_36775671_40444896_1_1_1_1,00.html

Overweight and Obesity (2008, July). Department of Health and Human Service Center for Disease Control and Prevention. Retrieved July 1, 2008, from http://www.cdc.gov/nccdphp/dnpa/obesity/

Pollan, M. (2006). *Omnivours Dilema, A Natural History of Four Meals.* New York: The Penguin Press.

Schlosser, E.(2001). *Fast Food Nation.* Boston: Houghton Mifflin.

Shiva, V. (2000). Stolen Harvest: the hijacking of the global food supply. Cambridge, MA: South End Press.

Smil, Vaclav (2001). *Feeding the World: A Challenge for the Twenty-First Century*. Cambridge, MA: M.I.T. Press.

The State of Food Insecurity in the World 2006 Report (2006). Food and Agriculture Organization of the United Nations. Retrieved February 18, 2008, from http//:www.fao.org/docrep/009/a0750e00.htm

Stiefel, C. (1998, April 13). Population puzzle: is the world big enough? - sustaining population growth *Science World*. Retreived May 1, 2008, from http://findarticles.com/p/articles/mi_m1590/is_n13_v54/ai_20571787

Unites States Department of Agriculture.(2006).The Census of Agriculture 2002 Census Publications. Retrieved March 12, 2008, from http://www.agcensus.usda.gov/Publications/2002/index.asp

United States Department of Agriculture Agricultural Research Service. (2007). Evolution of the plow over 10,000 years and the rationale for no-till farming. Retrieved February 24, 2008, from Website: http://www.ars.usda.gov/SP2UserFiles/Place/36450000/Products-Reprints/2007/1403.pdf

United States Department of Agriculture Economic Research Service. (2008). Adoption of Genetically Engineered Crops in the U.S. Retrieved June 12, 2008, from http://www.ers.usda.gov/data/biotechcrops/

United States Department of Agriculture Economic Research Service. (2005). Agricultural Chemicals and Production Technology: Pest Management. Retrieved April 11, 2008, from http://www.ers.usda.gov/Briefing/Agchemicals/pestmangement.htm#pesticide

United States Department of Agriculture Economic Research Services.(2008, February 12). Farm Income and Costs. Retrieved March 12, 2008, from www.ers.usda.gov/Briefing/FarmIncome/

United States Department of Agriculture Agricultural Marketing Service. (2008). Farmer's Market Growth. Retrieved February 29, 2008, from http://www.ams.usda.gov/farmersmarkets/FarmersMarketGrowth.htm

United States Department of Agriculture Economic Research Service. (2006).Percent of income spent on food in the U.S. Retrieved May 4, 2008, from www.ilfb2.org/fff06/51.pdf

United States Department of Labor (2003). The National Agricultural Workers Survey: Findings from the National Agricultural Workers Survey (NAWS) 2001 – 2002. Retrieved March 18, 2008, from http://www.doleta.gov/agworker/report9/toc.cfm

U.S. Organic Industry Overview: OTA's 2006 Manufacturer Survey (2006). Organic Trade Association. Retrieved February 29, 2008, from http://www.ota.com/pics/documents/short%20overview%20MMS.pdf)\

What is a sustainable community food system? (2006). University of California Davis. Retrieved February 12, 2008, from http://www.sarep.ucdavis.edu/cdpp/cfsdefinition.htm

World Trade Organization and UN Food and Agriculture Organization, as cited in *The Penguin Atlas of Food.* E. Millstone and Tim Lang. New York: Penguin Books. 2003.

World Bank. (2008). Rising food prices: Policy options and World Bank response. Retrieved May 3, 2008 from http://www.worldbank.org/html/extdr/foodprices/

Strawberry Stories References

2006-2007 California Strawberry Commission Annual Production Research Report (2007). California Strawberry commission. Retrieved july 423, 2008, from, http://www.calstrawberry.com/research/researchreport.asp

California Strawberry Commission Acreage Survey (2007). Californial Strawberry commission. Retrieved July 27, 2008, from http://www.calstrawberry.com/commission/asurvey.asp

California Strawberry commission, 2007 Production Research Report

Guerena,M. & Born, H. (2007). Strawberries: Organic production. National Sustainable Agriculture Service. Retrieved July 29, 2008, from http://attra.ncat.org/attra-pub/strawberry.html

Ikramuddin, A. (1997, June). Strawberry Fields: In a Jam. *National Geographic, 40.* Retrieved July 12, 2008, from http://www.thegreenguide.com/doc/40/strawb