WSU’s Environmental Issues Committee presents
A Panel Discussion on

The environmental impact of the food industry

March 24, 2009
12-1:30 PM
Wildcat Theater

Panelists

Jennifer Turley: Food system sustainability, definitions and a fishy example
Patricia Cost: Health and environmental issues related to pesticides, herbicides, and/or fertilizers
Claire Uno: The importance of having fresh, organic food available to everyone and the benefits of gardening
Michele Skopec: Effects of factory animal farming on the environment
Pat Ford: Artisan cheese making, a sustainable journey
Panel Q&A
Food system sustainability, definitions, and a fishy example

Food System

Food Production: farming, gardening, fisheries, wild foods
Consumption, purchasing, preparing, eating, waste management
Transformation, processing, packaging, labeling, marketing
Access, retailing, food safety net
Distribution, wholesaling, warehousing, transportation
The Detriments

The US food system is currently detrimental to the environment, human health, and future sustainability. A sustainable food system promotes ecological, human, and community health now and for the future.

- Issues from:
  - The use, loss, and pollution of land, soil & water.
  - The contribution to global warming from emission of greenhouse gases.
  - Fossil fuel depletion.
  - Loss of the land fertility and nutrients that nourish plants and animals.
  - More human (infectious and chronic) and animal diseases.

Detritmental to Water, Energy, Land

- Water: plant and animal farming accounts for 70% of all water use by humanity; 90% in most developing countries. US food system uses ~80% of US fresh water.
- Energy: Fossil energy for fertilizers, machinery, irrigation, pesticides, transportation, etc.
  - 1 Calorie of plant protein requires ~2.2 Calories of fossil energy.
  - Most adults require 2000-3000 calories/day depending on their age, gender, and physical activity.
  - Raising livestock for meat requires more energy (Calories, grain feed) than animal byproducts (milk & eggs), and plants.
- Soil: US food system uses ~50% of US land area. Croplands, pastures, and rangelands are losing soil (overgrazing, tilling) at an unsustainable rate. It takes ~500 y to replace 1” soil.
- Meat-based diet requires more energy, land, and water resources than the lactoovo or vegetarian diet.

(Somlydy 2006, Pimentel 2003, Horigan 2002)
Sustainable Food System

Grow it, buy it, cook it local

- Food production with resource conservation
  - Crop & grazing rotation, cover crops, no/low-till, managing soil, nutrients, biodiversity, pest.
- Local & regional suppliers
- More whole & seasonal foods with less processed & fast foods
- Diet is plant-based & augmented with animal foods produced in a sustainable way

Sustainable food system

Limit eating out, processed & fast food

MyPyramid

GRAINS  VEGETABLES  FRUITS  MILK  MEAT & BEANS

Steps to a healthier you

MyPyramid.gov
The Organic Plant

- Organic generally improves soil fertility, maintains ecological harmony/biodiversity, and eliminates pesticides, artificial fertilizers, & sewage sludge.
- Certified organic plant foods are also non-genetically modified organisms (non-GMO).

Utah farmer’s Market:
http://www.utahsown.utah.gov/
Community Supported Agriculture:
http://www.slowfoodutah.org/

Local Organic CSA:
Bell Organic Gardens in Draper
www.bellorganic.com
Zoe’s Garden in Layton
www.zoegarden.com
**GM Concerns**

*Why are plants GM?* For insect & viral resistance, herbicide tolerance, delayed ripening, plant sterility, and modified oils.

*What type of plants are GM?* Corn, tomatoes, potatoes, soybean, rice, squash, papaya, flax, cantaloupe, and others.

- Unexpected changes in tissue composition from gene activation or suppression.
- New plant species & naturally occurring toxicant levels (allergy and sensitivity).
- Plants with substances not normally found in species (allergens, vegetarianism).
- Marker gene required for identification of altered cells & antibiotic resistance.
- Risk of plants used to make nonfood oils or starch entering the food supply.
- Legal issues of false non-GMO labeling by manufacturers & farmers dealing with unintentional crop migration.
- Altered nutritional profile.
- Threatened biodiversity.
- Not labeled.

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**The Organic Animal**

- Organic beef, pork, poultry, eggs, and dairy foods may be healthier because:
  - Less pesticide exposure, fed organic feed.
  - Less antibiotics and hormones
  - More nutritional value (iron demise of 50-60% since 1940)
**The Organic Animal**

**Conventional:** USDA defined with likely hormone implant, therapeutic and sub-therapeutic antibiotic use, chemical fertilizer & pesticide use, grazing (70%) and confinement (30%), meat & bone meal prohibited, fed tallow (animal fat), manure applied to land.

**Natural:** Minimal processing & additives. Grazing (70%) & confinement (30%). Maybe’s in conventional practice. Tallow & manure allowed.

**Grass-fed:** No definition, more free range. Grazing (80%) & confinement (20%). Tallow & manure allowed.

**USDA Certified Organic:** All conventional aspects prohibited. Grazing (80%) & confinement (20%). Gov't standards mandated on manure applied to land. Always organic vegetarian. Never ever antibiotics, hormones, or preservatives.

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**Fish Farming**

*There are many aquaculture methods & species, some are sustainable.*

**Sustainable:** herbivore (plant eater) & omnivores (plant and animal eaters).

- **Tilapia** thrive on inexpensive vegetable-based foods.
- **Oysters, clams and mussels** improve water quality as they filter plankton out of the water for their food.

**Unsustainable:** carnivores (animal eaters).

- Salmon, tuna, and shrimp require feed that's made from wild fish.

Fish Farming

1. **Cages/pens:** waste, diseases and parasites can freely spread to wild habitat. Farmed fish can escape and compete with wild fish for natural resources, interbreed with wild fish.
2. **Raceways:** same concerns as cages/pens.
3. **Ponds:** can destroy coastal habitat to build facility. Discharged untreated wastewater pollutes the environment and contaminates groundwater.
4. **Recirculating systems:** fish cannot escape, wastewater is treated, but are costly to operate and rely on electricity or other power sources.
5. **Shellfish culture:** when farmed in high densities with little current/tidal flow leads to the accumulation of waste and the possibility of out-competing native species for natural resources.

Source: http://www.montereybayaquarium.org/cr/cr_seafoodwatch/sfw_gear.aspx

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Seafood Watch Pocket Guide

**BEST CHOICES**

- Arctic Char (farmed)
- Barramundi (US farmed)
- Catfish (US farmed)
- Clams (farmed)
- Coldwater Salmon (Atlantic)
- Saltwater Salmon (Atlantic)
- Shellfish (farmed)
- Tuna (Albacore, Longtail)
- Tuna (Whitefin, Yellowtail)
- Tuna (Yellowfin, Bluefin)
- Tuna (Yellowfin, Bigeye)
- Tuna (Yellowfin, Thunnus)
- Tuna (Yellowtail, Albacore)

**GOOD ALTERNATIVES**

- Clams (wild)
- Cod (Pacific, Alaska)
- Crab (Alaska)
- Flounder (Pacific, Alaska)
- Herring (Atlantic, Pacific, Alaska)
- Lobster (Atlantic, Maine)
- Mahi-mahi (Atlantic, Florida)
- Oyster (freshwater)
- Pacific halibut (Alaska)
- Shrimp (US farmed)
- Smelt (Rainbow)
- Sockeye (Alaska)
- Sablefish (Alaska)
- Surfperch (California)
- Tuna (Albacore, Longtail)
- Tuna (Yellowtail, Albacore)
- Tuna (Yellowtail, Thunnus)
- Tuna (Yellowtail, Yellowfin)

**AVOID**

- Chinese Seabass
- Rockfish
- Salmon (farmed)
- Shrimp (imported)

**Support Ocean Friendly Seafood**

Best Choices are abundant, well-managed and caught or farmed in environmentally-friendly ways.

Good Alternatives are an option, but there are concerns with how they are caught or farmed or with the health of their habitat due to other human impacts.

Avoid for now as these items are caught or farmed in ways that harm other marine life or the environment.

Key:

- **Sustainable**
- **Not推荐**
- **Wild-capture**
- **Certified by**

Source: http://www.montereybayaquarium.org/cr/cr_seafoodwatch/download.aspx
PESTICIDE/HERBICIDE/FERTILIZER

- **Pesticide**: is any substance or mixture intended to control, destroy, repel, or attract a pest.

- **Herbicide**: is a chemical used to kill or otherwise manage certain species of plants considered as pests.

- **Fertilizer**: Any number of organic and synthetic materials, (including manure and nitrogen, phosphorus, and potassium compounds) spread on or worked into soil to increase its capacity to support plant growth.
### PUBLIC HEALTH CONCERNS

- Pesticides and herbicides are a public health concern and have been linked to a range of diseases and disorders.
  - Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species.
  - Pesticides can contribute to air pollution.
  - In the U.S. pesticides were found to pollute every stream and over 90% of wells sampled in a study by the US Geological Survey. (2/07)
  - Many of the chemicals used in pesticides are persistent soil contaminants, whose impact may endure for decades and adversely affect soil conservation.

### ENVIRONMENTAL EFFECTS OF PESTICIDES

- Nitrogen fixation, which is required for the growth of higher plants, is hindered by pesticides in the soil.
- Animals may be poisoned by pesticide residues that remain on food after spraying and widespread application of pesticides can eliminate food sources that certain animals need.
- Birds are common examples of non-target organisms that are impacted by pesticide use. The book *Silent Spring* dealt with the topic of loss of bird species due to bioaccumulation of pesticides in their tissues.
- Fish and other aquatic biota may be harmed by pesticide-contaminated water.
ENVIRONMENTAL EFFECTS OF PESTICIDES

- Some scientists believe that certain pesticides already exist at levels capable of killing amphibians.
  - Multiple pesticides appear to have cumulative toxic effects on frogs. They suffer from congenital eye deformities, their nervous system is adversely affected, and the herbicide Atrazine has been shown to turn male frogs into hermaphrodites, decreasing their ability to reproduce.
- Pests may evolve to become resistant to pesticides.
- Some pesticides, including Aldrin, Chlordane, DDT, and Toxaphene, are considered to be persistent organic pollutants (POPs). POPs resist degradation and remain in the environment for years.

ENVIRONMENTAL EFFECTS OF HERBICIDES

- If herbicides aren’t used properly, damage may be caused to crop plants. 2,4-D is toxic to many broadleaf weeds, but not to wheat, maize, or corn, barley or rice.
- Herbicides can change the habitat of animals such as mammals and birds, especially true of herbicide use in forestry.
- Often there is a drift of herbicides when they are sprayed (spray-drift) and this causes unintended off-site damage to vegetation and indirect exposure of people.
- Glyphosate-based herbicides are very toxic to fish, extremely toxic to soil life, and damages or reduces the populations of earthworms.
ENTRY OF CHEMICALS INTO HUMANS

- There are many ways humans are exposed to pesticides:
  - Inhalation (from drift)
  - Ingestion (food residues, water contamination)
  - Skin (dermal) penetration
  - Transplacental absorption
  - Breast milk
- Once a chemical enters the body, it is often absorbed into the bloodstream and can move throughout the body.
- **Example:** A pesticide which is sprayed can be inhaled during use; penetrate through the skin during mixing and application; and be ingested through food which can be minimized by rinsing plant foods and removing fat from animal foods.

HUMAN HEALTH ISSUES RELATED TO PESTICIDES

- **Neurological Effects:** pesticides can be potent neurotoxins. When exposed a person would feel dizzy, lightheaded, confused, and may have reduced coordination and ability to think. These are short-term effects, while long-term exposure can result in reduced IQ and learning disability, associated with permanent brain damage.
- **Asthma**
- **Non-specific upper and lower respiratory symptoms**
- **Infections**
- **Hypersensitivity diseases**
### HUMAN HEALTH ISSUES RELATED TO PESTICIDES

- **The commonly used pesticide (Dursban) was known to cause birth defects and hormone disruption in utero. Twenty-four pesticides still on the market, including 2,4-D, Lindane and Atrazine, are known endocrine disruptors.**

- **Some conditions related to hormone disruption are:**
  - Limb reduction birth defects
  - Cleft palate
  - Hypospadias (a defect of the penis in which the urinary tract opening is abnormally located away from the tip of the penis.)
  - Undescended testicles
  - Precocious puberty in girls
  - Reduced sperm counts

- **Organophosphates are widely used as an agricultural chemical, but are also the most common pesticide used indoors to kill termites, fleas, roaches, and in pest control strips.**

### HUMAN HEALTH ISSUES RELATED TO PESTICIDES

- **Pesticide poisoning (toxicosis)**
  - May look like the flu and the symptoms would be:
    - Headaches
    - Dizziness
    - Muscle twitching
    - Weakness
    - Tingling

- Pesticide poisoning is commonly under-diagnosed since health care providers generally receive very little training in occupational and environmental health.

- Childhood poisonings are complicated by the greater vulnerability of the very young.
HEALTH ISSUES RELATED TO PESTICIDE EXPOSURE

• Types of Cancer **more frequently** associated with chemical exposure:
  – Non-Hodgkin’s lymphoma
  – Leukemia
  – Multiple myeloma
  – Soft-tissue sarcoma
  – Prostate
  – Pancreatic
  – Lung
  – Ovarian

• Types of Cancer **less frequently** associated with chemical exposure:
  – Breast
  – Testicular
  – Hodgkin’s Disease
  – Liver
  – Kidney
  – Rectal
  – Brain and neurologic system
  – Stomach
  – Endometrial
## ORGAN SYSTEMS AFFECTED BY TOXIC EXPOSURE

<table>
<thead>
<tr>
<th><strong>Category</strong></th>
<th><strong>System affected</strong></th>
<th><strong>Symptoms</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td>Nose, trachea, lungs</td>
<td>Irritation, coughing, tight chest</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Stomach, intestines</td>
<td>Nausea, vomiting, diarrhea</td>
</tr>
<tr>
<td>Renal</td>
<td>Kidney</td>
<td>Back pain, urinating more or less than normal</td>
</tr>
<tr>
<td>Neurological</td>
<td>Brain, spinal cord</td>
<td>Headache, dizziness, confusion, convulsions</td>
</tr>
<tr>
<td>Dermatological</td>
<td>Skin, eyes</td>
<td>Rashes, itching, swelling</td>
</tr>
<tr>
<td>Reproductive</td>
<td>Ovaries, testes</td>
<td>Infertility, miscarriage</td>
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**CLAIRE UNO**  
*Executive Director of Wasatch Community Gardens*

*The importance of having fresh, organic food available to everyone and the benefits of gardening*
MICHELE SKOPEC
Assistant Professor of Zoology, WSU

The effects of factory animal husbandry on the environment

Factory farming
- Confined or concentrated animal feeding operations
  CAFOs
Benefits of factory farming

• Makes meat readily available
  – Americans consume 217 lbs of meat per year compared to people in India averaging 11 pounds
  – We have 5% of the world’s population but process 10 billion animals a year (15% of the world total)
  – World’s total meat supply was 71 million tons in 1961 and 284 million tons in 2007

• Prices of beef, pork and poultry have held steady for 40 years or more

Negatives of factory farming

• Makes meat readily available and cheap
  – Increases demand which increases production

• Takes livestock out of a semi-natural environment and puts livestock into high density unnatural environments that lead to increased
  – Greenhouse gas emissions
  – Water pollution
  – Disease
  – Ethical issues

2006 publication by the Food and Agriculture Organization of the UN
Cheap meat

- American’s meat consumption has increased 50lbs per person in the last 50 years
- American’s consume 110 grams of protein a day (75grams as animal protein), almost twice the RDA
- Increased meat consumption can be linked to increase risk of CVD, diabetes and some cancers
- Demand for meat is expected to double by 2050 as population grows and becomes wealthier
- Almost 30 percent of the earth’s ice-free land is directly or indirectly involved in livestock production

Livestock as part of the environment

- Livestock used to be integrated into carbon and nitrogen cycles of small farms

From: http://www.farmingfutures.org.uk/x510.xml
http://thefraserdomain.typepad.com/energy/2007/07/e3-biofuels-eff.html
Meat’s carbon footprint

- Livestock production produces 18% of CO₂ equivalents
- Transportation is 15%
- Factory farms are noisy and smelly and are therefore far from communities, so more fuel used for transport

Meat’s messy problem

- Iowa hog factories alone produce 50 million tons of excrement
  - Put into lagoons not waste treatment facilities
  - Lead to eutrophication of nearby waterways
  - Antibiotics and hormones can also contaminate nearby waterways
Meat’s dangerous problem

- In order to minimize disease and increase production many animals in factory farms are given antibiotics
  - More than half of world supply of antibiotics are used on animals
  - Could lead to antibiotic resistance
- Unnatural feeding practices like fattening cattle on grain has led to development of more pathogenic bacteria
  - E. coli O157:H7
- Feeding meat and bone meal led to Mad Cow Disease

Meat’s ethical problem

- 800 million people suffer from hunger and malnutrition but most of the corn and soy grown goes to livestock
  - Takes 2-10 times more grain to produce the same amount of calories through livestock as through direct grain consumption
  - It takes 3lbs of wild fish to raise 1lb of farmed salmon
- Increasing rangeland is a major reason for deforestation
Meat’s ethical problem

• High density housing for livestock can lead to substandard conditions
• Leads to high density processing facilities with poor conditions for both animals and workers

What can you do?

• Have a meat free day once a week
  – If all Americans had a MFD it would be like taking 8 million cars off the road
• Decrease beef consumption
  – Grain fed beef in the US take 10 times more grain to produce the same amount of calories through livestock as through direct grain consumption
• Buy locally from small producers
• Grow your own
  – Backyard chickens
PAT FORD
Co-Owner The Beehive Cheese Company

Artisan cheese making, a sustainable journey