EATING SUSTAINABLY:

An Introduction to Sustainable Food




sustainability initiatives

EMORY

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Table of contents

Sustainable Food Committee, Emory University

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Defining sustainability and sustainable food

Definitions of sustainability often refer to aspects of enduring environmental, social and economic well being. While the notion of sustainable food has evolved over time and continues to change with new evidence, there is a consensus that sustainable agriculture must be ecologically sound, economically viable, and socially responsible.[1] Thus, a broad definition of sustainable food links agricultural production that safeguards soil, water, and wildlife with a nutritious diet that supports public health[2], and sees food as part of a just and economically sound society. In this view, a sustainable food and agricultural system is one in which:

- *The environment is protected*. The health of the soil is maintained, water quality is secured, the flow of energy and discharge of waste, including greenhouse gas emissions, are within the capacity of the earth to absorb, and biodiversity is protected and promoted.
- *Food producers are treated well*. Farmers and all other players in the production chain have fair, livable incomes, and safe working conditions.
- *The food we eat is of good quality*. Animal and human health is supported by a wide variety of nutritious and delicious foods, and is affordable and accessible for all.
- *Agro-economies are supported*. Rural communities are enhanced and supported, and are linked to urban communities through small businesses.
- *Fresh, healthy food is available to all*.

The industrial, corporate food production system prevalent today offers cheap food, but such low cost does not reflect the true costs of agriculture, including loss of crop biodiversity through monoculturing, soil erosion and depletion, contamination of water and air, antibiotic resistance, and heavy dependence on non-renewable resources such as petroleum, creating a less resilient and secure food system.[3] Centralized control over our agricultural system limits consumers' ability to know how food is grown, how safe it is, and whether farm communities are enhanced or harmed.[4,5]

Local, community-based, participatory food systems are an alternative to the global corporate models in which producers and consumers are separated from one another. A local food system encourages the idea of the consumer as active participant, or co-producer.[6] This model focuses on relationships among the food producers, processors, distributors, retailers and consumers and increases knowledge about the characteristics of our food.[3] The development of local food systems is not only about environmental impacts but also the social and economic benefits it promotes, which include:

- Diversity of many economically viable small family farms rather than huge factory farms
- Environmental outcomes that enhance our natural resources for future generations
- Robust economic links between urban and rural communities through networks of small businesses
- Preventive health of individuals rather than focusing solely on disease treatment
- Equitable treatment for all participants in the food chain

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[2] Hamm, Michael W. 2008. "Linking Sustainable Agriculture and Public Health: Opportunities for Realizing Multiple Goals." *Journal of Hunger and Environmental Nutrition* 3:169-185.
[3] Kirschenmann, Frederick L. 2008. "Food as Relationship." *Journal of Hunger and Environmental Nutrition* 3(2):106-121.
[4] Barlett, Peggy F. 1989. "Industrial Agriculture" in *Economic Anthropology*, Stuart Plattner, ed. Pp. 253-291. Stanford, CA: Stanford University Press.
[5] Hassanein, Neva. 2003. "Practicing Food Democracy: A Pragmatic Politics of Transformation." *Journal of Rural Studies* 19:77-86.
[6] Petrini, Carlo. 2007. *Slow Food Nation*. NY: Columbia University Press. pp. 227-237

Food, foodshed, soil, and place

"Civilizations have destroyed themselves by destroying their farmland"
Wes Jackson and Wendell Berry[1]

Food has the potential to strengthen our sense of place, intertwining meaning and identity. Eating locally, learning about traditional foods, and attending to the seasons are ways to become more conscious of food choices and their implications for the planet. Food invites other languages of attachment, restoring our lived relationships with place. Tastes of fresh, local food, together with traditional varieties of plants and animals that are well adapted to each locale, call forth an appealing vision of people living well and also responsibly with one another and with the land.

A revolution in transportation and communication since World War II, coupled with agricultural research and abundant cheap oil, has allowed us to develop a global food system that is detached in many ways from the soil.[2] Industrial food processing allowed new forms of food storage, long-distance travel, and extended shelf life.[3] The average person has little appreciation of the land or the farming practices suited to each locale.[4] Stories and memories are lost as well—and sometimes, even the seeds and plant varieties eaten by our great-grandparents.[5] Lack of public concern about farmland loss to urban sprawl, eroding topsoil, and declining rural communities reveals a general disconnection from the land. Social indifference to the farmers and farm workers who grow food echoes our disconnectedness to nature and season.[6]

An alternative to the industrial, global food system is a locally or regionally based system, made up of diversified farms using sustainable practices to supply fresher, more nutritious foodstuffs to small-scale processors and consumers, to whom producers are linked by bonds of community as well as economy.[7,8] Landscape is part of that community.

Consumer expectations are shifting towards such a system. In addition to acquiring healthy food, many consumers want to know where their food comes from, how it is grown, and who are the farmers.[9] They want to know if their own values, such as fair working conditions and humane treatment of animals, have been upheld all along the food chain. And more consumers are returning to seasonal food purchases, finding it tastier and cheaper to eat fruits and vegetables in season.

Foodshed

The concept of foodshed echoes the image of water flowing downhill and draws our attention to where our food comes from. What is Emory's foodshed? If we buy bananas from Costa Rica and coffee from Kenya, our foodshed is international. Foodshed activists seek to re-focus on the origins of our food, and to encourage purchases within a bioregion and with attention to impacts on the lands and cultures. Steps to help re-build an alternative food future are to:

- Strengthen decisions that include non-economic values, such as pleasure, loyalty, justice, friendship, and affection. Such decisions are made by individuals and institutions, such as Emory.

- Rebuild habits of eating together and fostering a relationship with the land that supports us. Celebrations can attend to seasons of strawberries, peaches, cantaloupes, tomatoes, corn, and other crops.
- Carve out "insulated spaces" where alternatives to conventional food can thrive, such as Emory's campus farmers market and new dining service commitments to sustainable food purchases.

Emory's efforts to increase sustainably-grown regional and Georgia-grown foods in dining halls and hospitals are one way that we seek to strengthen our local food system.

Grassroots efforts lead the way

Local food efforts often highlight direct marketing, ways of building stronger ties between consumers and farmers. Farmers markets, community-supported agriculture (CSAs or food shares), roadside stands, and farm-to-school programs all put "the farmer's face" on the food. Local food systems can build trust in fresher food, grown with methods that support an ethic of care for the land. Food cooperatives, restaurants that feature local produce and meats, and food businesses such as bakeries provide another way to eat local food. Community gardens and urban farming are important as well, building new, more intimate relationships with plants and strengthening the social fabric.

Organizations that have promoted such food alternatives are the Community Food Security Coalition (CFSC), a broad grassroots gathering of local food advocates who work for a revitalized local food system. CFSC works not only on local issues such as community gardens and farm-to-school programs, but also on farm bill legislation and reform of federal subsidies to conventional agriculture. Improving access to high-quality, fresh food in underserved neighborhoods—so-called "food deserts"—is central to food security work.[10] Where families are constrained by poor transportation, stocking even a small grocery store with fresh vegetables can increase dietary consumption of healthier foods.[11]

Other groups seek to rebuild their local foodsheds. In the 1990s, Hartford, Connecticut followed Toronto's lead in creating a Local Food Project. *Growing Power* in Milwaukee and Chicago and organizations such as the *Practical Farmers of Iowa* and the *Pennsylvania Association for Sustainable Agriculture* (PASA) have led the way. The *Food Routes* coalition developed over a dozen "Buy Fresh/Buy Local" campaigns around the country, supported by the Kellogg Foundation. On-line directories that guide consumers to local farmers, chefs, stores, and pick-your-own operations have been important information resources.[12]

Here in Atlanta, *Georgia Organics* has been active in maintaining a Local Food Guide (www.georgiaorganics.org) and has supported a range of activities to build a more sustainable food system. The *Atlanta Local Food Initiative* (www.atlantalocalfood.org) has created a "Plan for Atlanta's Food Future" endorsed by the Centers for Disease Control and President Jimmy Carter. The plan calls for actions to redress Atlanta's food deserts, support farm-to-school programs and community gardens, increase commitments to buy local, and support other ways to rebuild connections to place around food. *Southern Seed Legacy* (http://www.uga.edu/ebl/ssl/) and the Georgia chapters of *Slow Food* (http://www.slowfoodusa.org/) highlight biodiversity in agriculture and preservation of traditional varieties (often hardy and disease resistant).

Terroir and regional cuisine

Regions are often known for distinctive food products, and labeling systems can help consumers identify foods that support traditional foodways and growing practices. European labels-of-origin are well known in wine and cheese and are based on a sense of "terroir" or the special soils that produce tastes unique to a particular region. In the U.S., regional specialties are less likely to emphasize uniformity of a particular taste and more likely to highlight individual excellence of particular craft products. Faculty at the University of Missouri, together with many partners, launched a *Regional Cuisines Project* in 2002.[13] Missouri is famous for its cured hams and a particular pecan native to the state, and labeling these products allows them to gain value. Ecoregions have been delineated and as farmers become organized and standards are set, certification processes will highlight local products, allowing greater transparency for the consumer. These kinds of efforts call attention to local producers, soils, and the importance of preserving cultural traditions.

Sustainability calls for attention to how our food provisioning works with nature. The connection between humans, land, and food is scientific, but also philosophical and spiritual. "If a system of production has negative side-effects, and cares not about the resources on which it relies, then we have taken a path leading ultimately to disaster," says agricultural development leader, Jules Pretty.[14] As we seek to live up to Emory's sustainability vision ("Healthy Emory, Healthy Planet"), a revitalized relationship with soils, climate, seeds, farmers, and foodways is a deeply appealing vision, one that can guide us forward to honor the places we call home.

Peggy Barlett for the Sustainable Food Committee at Emory University

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[1] Jackson, Wes and Wendell Berry. 2008. "A 50-Year Farm Bill" *New York Times*, January 5.

[2] Kirschenmann, Frederick L. 2008. Food as Relationship. *Journal of Hunger and Environmental Nutrition* 3(2-3):106-121.

[3] Friedmann, Harriet 1993. After Midas's Feast: Alternative Food Regimes for the Future. In, *Food for the Future*. Patricia Allen, ed. Pp. 213-33. NY: Wiley.

[4] Jackson, Wes. 1994. "Becoming Native to this Place." *The Earthscan Reader in Sustainable Agriculture*. London: Earthscan.

[5] Berry, Wendell. 1990. "The Pleasures of Eating" from *What are People For?* NY: North Point Press, Farrar, Straus and Giroux. http://www.ecoliteracy.org/publications/rsl/wendell-berry.html.

[6] Hinrichs, C.Clare and Thomas A Lyson. 2007. *Remaking the North American Food System: Strategies for Sustainability*. Lincoln: University of Nebraska Press.

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[9] Barham, Elizabeth 2002. Toward a Theory of Values-Based Labeling. *Agriculture and Human Values* 19(4):349-360.

[10] Gottlieb, Robert 2001. *Environmentalism Unbound: Exploring New Pathways for Change*. Cambridge, MA: MIT Press.

[11] National Research Council 2009. *The Public Health Effects of Food Deserts*. Washington, DC: National Academies Press.

[12] Bedford, Christopher B. 2006. Meeting the Challenge of Local Food. *Business* 28(1):17.

[13] Barham, Elizabeth, David Lind, and Lewis Jett 2006 "The Missouri Regional Cuisines Project." In *Urban Place: Reconnecting with the Natural World*. Peggy F. Barlett, ed. Pp.141-72. Cambridge: MIT Press.

[14] Pretty, Jules 2002. *Agri-Culture: Reconnecting People, Land, and Nature*. London: Earthscan

Identifying sustainable food: an introduction to marketing terms

Food products and packages are peppered with marketing claims and terms espousing qualities that are designed to steer the consumer toward buying foods that are sustainable and healthy for people and the environment. But with so many terms to keep straight, how does one decide whether to buy the certified organic, vegetarian fed chicken or the free range certified humane chicken?

The first step is learning **what makes a good eco-label**. According to the Consumers Union Guide to Environmental Claims, "the best eco-labels are seals or logos indicating that an independent organization has verified that a product meets a set of meaningful and consistent standards for environmental protection and/or social justice."[1] This would be considered a third party label or claim because it is made by an entity other than the seller (first party) or the buyer (second party).

Because it is important to **be familiar with the more common food related claims and certifications,** below is a list of common marketing terms.[2] This list has been developed with the aid of the Sustainable Food Policy Project which was a collaboration of the following organizations: Food Alliance, Health Care Without Harm, Association for the Advancement of Sustainability in Higher Education, Oregon Center for Environmental Health, and the Institute for Agriculture and Trade Policy.

There are many more claims and certifications beyond this list, so it is important to **know where to go to find more information about specific eco-labels.** The Consumers Union Guide to Environmental Claims (http://www.greenerchoices.org/eco-labels/) as well as (http://ecolabelling.org) are helpful resources for learning more about these terms.

Labels Certified by an Independent Organization

Certified Humane Raised & Handled

This label is designed to certify that animals raised for dairy, lamb, poultry and beef products are treated in a humane manner. Under the program, growth hormones are prohibited and animals are raised on a diet without antibiotics, though antibiotics can be used in the treatment of sick animals. Access to clean and sufficient food and water and a safe and healthful living environment are also required from birth through slaughter. Producers also must comply with environmental standards. Processors must comply with the American Meat Institute Standards, a higher standard for slaughtering farm animals than required by the Federal Humane Slaughter Act. www.certifiedhumane.com

Fair Trade Certified

Fair Trade standards aim to ensure that farmers in developing nations receive a fair price for their product and have direct trade relations with buyers and access to credit. They encourage sustainable farming practices and discourage the use of child labor and certain pesticides. To bear the label, products must be grown by small-scale, democratically organized producers. Fair Trade Certified products include coffee, tea, chocolate, sugar, bananas and other tropical fruit, rice and grains. TransFair USA is the third-party certifier of Fair Trade goods in the US. It is one of twenty members of Fairtrade Labeling Organizations International, the umbrella organization that sets certification standards. www.transfairusa.org

Food Alliance Certified

To earn FA certification, farms and ranches must meet standards that provide safe and fair working conditions; ensure healthy and humane care for livestock without adding hormones or non-therapeutic antibiotics; use no genetically modified crops or livestock; reduce pesticide uses; conserve soil and water resources; and protect wildlife habitat. Farmers are required to set goals for continual improvement and sign an affidavit that genetically engineered crops are not used. www.foodalliance.org

Marine Stewardship Council

The Marine Stewardship Council (MSC) is a non-profit organization that promotes responsible fishing practices. The MSC label assures buyers that products come from a well-managed fishery and have not contributed to overfishing. MSC certification standard includes these principles:

1) *The condition of the fish stocks* (examines if there are enough fish to ensure that the fishery is sustainable).
2) *The impact of the fishery on the marine environment* (examines the effect that fishing has on the immediate marine environment including other non-target fish species, marine mammals and seabirds).
3) *The fishery management systems* (evaluates the rules and procedures that are in place, as well as how they are implemented, to maintain a sustainable fishery and to ensure that the impact on the marine environment is minimized).

www.msc.org

Organic

In order to be labeled "organic," products must meet the federal organic standards as determined by a USDA-approved certifying agency. Organic foods cannot be grown using synthetic fertilizers, chemicals, or sewage sludge; cannot be genetically modified; and cannot be irradiated. Organic meat and poultry must be fed only organically-grown feed (without any animal byproducts) and cannot be treated with hormones or antibiotics. In order to bear the USDA "Certified Organic" seal, a product must contain 95 to 100% organic ingredients. Products that contain 70% to 94% organic ingredients can be labeled "Made with Organic Ingredients," but cannot use the USDA "Certified Organic" seal. Organic ingredients can be listed on the packaging of products that are not entirely organic.
www.ams.usda.gov/NOP/indexNet.htm

Rainforest Alliance Certified

The Rainforest Alliance works to conserve biodiversity and ensure sustainable livelihoods by transforming land-use practices, business practices, and consumer behavior. The Rainforest Alliance Certified seal is found on coffee, cocoa, chocolate, bananas, orange juice, guava, pineapple, passion fruit, plantains, macadamia nuts, and other tropical products. On certified farms, rainforest is conserved, workers are treated fairly, soil and water quality are not compromised, waste is managed efficiently, chemical use is dramatically reduced, and relations with surrounding communities are strong. www.rainforest-alliance.org/index.cfm

Smithsonian Bird Friendly

The goal of the third party Bird Friendly certification program is to foster conditions on coffee plantations that provide good bird habitats. Maintenance of the tree canopy, diversity in tree and plant species, shade at specific times of the day, and establishment of plant borders around streams or rivers are all included into the Bird Friendly label criteria. The Smithsonian Migratory Bird Center (SMBC) only allows organic certifiers to issue the Bird Friendly label on organically certified products. Organic inspectors must complete a "Shade Certification Check List" and sign a certificate before the SMBC will allow the use of the Bird Friendly seal of approval.
http://nationalzoo.si.edu/ConservationAndScience/MigratoryBirds/Coffee/

Labels Not Certified by an Independent Organization

Antibiotic Claims

The USDA has prohibited use of the term "Antibiotic Free" as a label claim for meats and poultry, but allows "Raised Without Antibiotics" or "No Antibiotics Administered." These claims imply that no antibiotics were administered to the animal at any point during its life. If an animal becomes sick and requires treatment, it should be segregated from other animals and sold as a conventional meat product. There is often no independent verification of these antibiotic claims.

Cage Free

This is a first party claim that poultry were raised without cages. This does not guarantee that birds were raised with access to the outdoors or on pasture. Birds may have been raised in large flocks in commercial confinement facilities with open floor plans. There is often no independent verification of "Cage Free" claims.

Free Range

Free range and related terms are popular label claims for poultry and eggs and are sometimes seen on other meats. Free range is regulated by the USDA for use on poultry only (not eggs), which requires that birds be given access to the outdoors for an undetermined period each day. In practice, the "Free Range" claim does not guarantee that the animal actually spent any period of time outdoors, only that access was available. Birds may have been raised in large flocks in commercial confinement facilities with open floor plans. There is often no independent verification of "Free Range" claims.

Genetically Modified Organism (GMO) Claims

With growing consumer concern for genetically modified crops and livestock entering the food supply chain, a number of companies have begun to assert their food products are "GMO-Free." The US organic standards offer independent verification of the process of food production, but there is no guarantee that the product is uncontaminated by GMOs. Some certification programs, such as Organic and Food Alliance, prohibit genetically modified ingredients in certified foods and have corresponding inspection protocols. However, laboratory tests may be necessary to provide maximum surety there has been no cross-contamination of products.

Grassfed

As defined by the American Grassfed Association, this claim means that animals live on pasture, consume a natural forage diet, and do not receive hormone or antibiotic treatments. However, the USDA, in a standard published for comment in 2006, has defined "grassfed" to only mean animals that consume a diet of grasses and silage. The USDA standard does not prohibit confinement or hormone and antibiotic treatments. Suppliers should be clear which standard they claim to meet. There is currently no independent verification of this claim under either standard. Note that "Grassfed" claims are sometimes qualified with supplemental "Grain Finished" claims. This combination describes the conventional industrial livestock feeding model, and invalidates the "Grassfed" claim.

Hormone Claims

The USDA has prohibited use of the terms "Hormone Free," but meats can be labeled "No Hormones Administered," meaning that the animals in question did not receive hormone injections or feed supplements. Claims are also frequently asserted that milk products are "rBGH-Free" and/or "rBST-Free." (rBGH and rBST are hormone supplements given to dairy cows to increase milk production.) Federal law prohibits the use of hormones in hogs and poultry, so hormone claims for chicken or pork should be considered misleading. There is often no independent verification of hormone claims.

Natural

USDA guidelines state that "Natural" meat and poultry products can only undergo minimal processing and cannot contain artificial colors, artificial flavors, preservatives, or other artificial ingredients. "Natural" is used with similar meaning with other food products as well. Beyond this limited definition, "natural" should be considered a meaningless claim. The term does not offer any information about the social or environmental impact of the product. It does not guarantee that livestock were humanely raised or provide information about use of hormones or antibiotics. It does not guarantee that crops were raised according to any standard. There is typically no independent verification of "natural" claims.

Omega-3

This label is a first-party claim seen on a wide variety of foods from mayonnaise to margarine, eggs, cereal, milk, yogurt, cookies, frozen pizza, and canned fish. There are three main omega fatty acids in food: DHA (docosahexaenoic acid), EPA (eicosapentaenoic acid) and ALA (alpha-linolenic acid). Evidence for DHA and EPA and disease prevention is somewhat stronger than the evidence for ALA.[3] Food companies are not required by the FDA to indicate the source of omega-3s. Additionally, foods labeled as containing omega-3s vary widely in amount per serving, so it is important to read the fine print on the package.[4]

Vegetarian Diet

This is a first-party claim that livestock were not fed any animal by-products. With the appearance of "mad cow disease," which is transmitted through animal by-products added to cattle feed, vegetarian diets are increasing. The claim does not indicate that animals were fed a natural forage diet. Animals may have been fed corn or other grains, agricultural by-products or food processing wastes (such as potato peels). Animals may have received antibiotics or other feed supplements. There is often no independent verification of this claim.

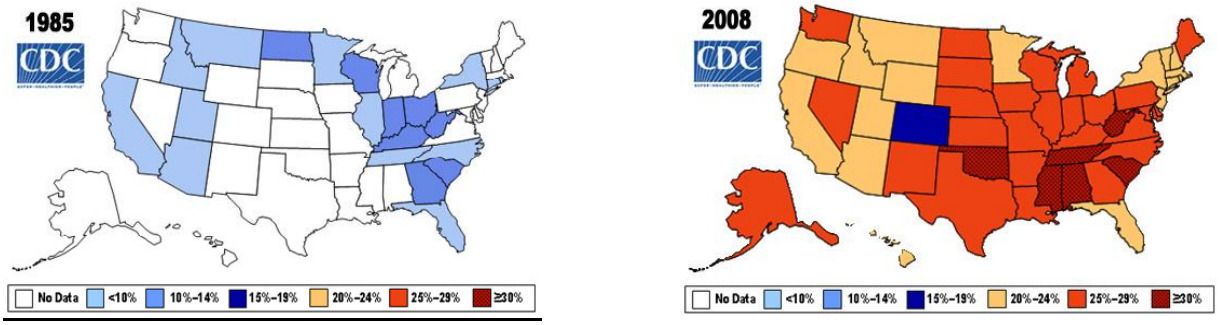
Kip Slaughter for the Sustainable Food Committee at Emory University

[1] Consumers Union Guide to Environmental Claims. Available at: http://www.greenerchoices.org/eco-labels/
[2] A Guide to Developing a Sustainable Food Purchasing Policy.Available at: http://www.sustainablefoodpolicy.org
[3] Essential Fatty Acids. Linus Pauling Institute. Available at: http://lpi.oregonstate.edu/infocenter/othernuts/omega3fa/
[4] Center for Science in the Public Interest. http://www.cspinet.org/new/pdf/omegas.pdf

Health benefits of eating sustainably

- **There are 1 billion overweight and 300 million obese adults worldwide**[1]
- **300,000 deaths per year in the US can be attributed to obesity**[1]
- **Obese individuals are at a 50-100% higher risk of premature death**[1]

US Obesity Trends by State
Obesity is defined as a body mass index (BMI) index of 30 or greater. BMI is calculated from a person's weight and height. The maps show the percent of US adults who are obese.



cdc.gov

Why? Influences from the Toxic Environment

According to Wang and Brownell at Yale, "animals are adept at regulating a very steady body weight until they are placed in a situation in which palatable, high-fat, high-sugar food is consistently accessible to them. Under these conditions, laboratory animals overeat and become far heavier than their normal body weight, even when nutritionally balanced food is available." They further assert, "although individuals have the ability to make choices, it is difficult to make healthy choices and to succeed when the environment is stacked against them."[2]

Calorie-dense but nutrient-poor food
The past 60 years saw an increase in the consumption of energy-dense foods, high in saturated fats and sugar. Energy-dense, nutrient-sparse alternatives replaced low calorie, nutrient-rich foods and drinks; for example, soda replaced milk and salty snacks replaced fruits. One can of A&W Root Beer has 4 tablespoons of sugar and 170 calories. The same amount of skim milk has 120 calories and nutrients like protein, calcium, and vitamin D. We now eat on the run and rely on a "quick fix" to satiate hunger. Fast food is often highly processed and fried in oil with saturated fats. Eating out increased 89% from 1972 to 1995. Research shows that people consume almost 200 more calories per day eating outside the home.[2]

Exercise
Also, as Americans consume more energy, they expend fewer calories. One-fourth of Americans report being completely sedentary. Half of children walked to school in 1950, but only 10% of children report walking to school today.[2] Furthermore, most popular leisure activities, such as watching television, require little to no physical activity.

Portion size

Portion sizes of some foods have increased two-fold since the 1950s -- bagels are twice the size and candy bars come in "King Size." A turkey sandwich may be a healthy choice for lunch, but may contain enough meat and bread for two meals.[3] Some super-sized fast food meals pack the daily calorie recommendations into a single meal.[4]

Portion size: 1987 versus 2007[5]

Cheeseburgers

1987: 333 calories

2007: 590 calories

Soda

1987: 85 calories

2007: 250 calories

Spaghetti and meatballs

1987: 500 calories

2007: 1025 calories

Human health consequences of obesity[6]

- Coronary heart disease
- Type 2 diabetes
- Cancers (endometrial, breast, and colon)
- Hypertension (high blood pressure)
- Dyslipidemia (for example, high total cholesterol or high levels of triglycerides)
- Stroke
- Liver & gallbladder disease
- Sleep apnea and respiratory problems
- Osteoarthritis (a degeneration of cartilage and its underlying bone within a joint)
- Gynecological problems (abnormal menses, infertility)

General guidelines

Eat more…

- ✓ Fruits and vegetables
  - Fill half your plate
  - The more color variety, the more nutritious
- ✓ "Whole Grain" carbohydrates (oatmeal, whole wheat bread, brown rice)[4]
  - Whole grains contain fiber which slows digestion and helps you feel full longer
  - Wheat bread is often highly processed. Don't be fooled by the "wheat" title—look for "whole"!
  - Items labeled "multigrain" are not necessarily whole grain; check the label.
- ✓ Protein from chicken, fish, grass-fed meats, and vegetable sources, such as beans and nuts[7]
- ✓ Unsaturated fats[9]
  - Substitute omega 6 or omega 3 unsaturated fatty acids for dairy and animal fat
  - Fish, beans, almonds, olives, avocados and many seeds contain the essential fatty acids that are beneficial to heart and skin health
  - Olive oil and canola oil are good sources of unsaturated fats

Eat less…

- ✓ Trans and saturated fats
  - Choose lower fat dairy options and lean protein such as fish or skinless poultry
  - Substitute grass-fed meats for grain-fed
  - Stay away from fried food and large amounts of butter or baked goods
- ✓ Soda and fruit juices
- ✓ Red meat [9]
- ✓ Food in general; be aware of portion sizes for your weight and activity levels:
  - One serving of meat looks like a deck of cards: most Americans consume twice the daily recommended value for protein. Other sources of protein such as beans, nuts, and tofu will help round out strengthen your diet.
  - One serving of peanut butter or salad dressing is about the size of a golf ball
  - When eating out, take half your meal to go and stretch your dollars, not your waistline.

Try to …

- ✓ Get 30 minutes of physical activity daily
- ✓ Take the stairs instead of the elevator; ride your bike to class or work. (This also benefits the environment!)
- ✓ Support parks, bike trails, and safe recreational spaces for all Atlanta residents. It is easy to forget that outdoor recreation is dangerous in some parts of town, which limits exercise.
- ✓ Promote efforts to make fresh foods available in all neighborhoods and schools.

Don't forget…

Every person's diet needs are different, but most researchers agree about certain basic principles of healthful diets: variety in food intake, moderation in calories, largely plant-based, and minimally processed.[8]

<http://www.eatdrinkandweighless.com/images/img-pyramid-lg.gi>

Becca Gittelson and Brooke Mills for the Sustainable Food Committee at Emory University

[1] "WHO | Obesity and overweight." October 2009. <http://www.who.int/dietphysicalactivity/publications/facts/obesity/en/>.
[2] Wang, S.S., & Brownell, K.D. 2005. "Public policy and obesity: The need to marry science with advocacy." *Psychiatric Clinics of North America*, 28:235-252.
[3] United States Department of Agriculture. October 2009. <http://www.mypyramid.gov/>.
[4] "Why People Become Overweight - Harvard Health Publications." November 2009. *Health Information and Medical Information - Harvard Health Publications*. <http://www.health.harvard.edu/newsweek/Why-people-become-overweight.htm>.
[5] National Resource Center on Nutrition, Physical Activity & Aging. April 2010. <*nutritionandaging.fiu.edu/DRI_and_DGs/mypyramid-portions.ppt*>
[6] "The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity." October 2009 *Office of the Surgeon General*. <http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact_consequences.htm>
[7] Willett, W. 2001. *Eat, Drink, and Be Healthy: The Harvard Medical School Guide to Healthy Eating*. New York: Free Press..
[8] Nestle, Marion. March 2010. "Confused about nutrition? Eat Food!" *Food Politics*. <http://www.foodpolitics.com/2010/02/confused-about-nutrition-eat-food/>

Nutrient content and sustainable food

There are a variety of reasons that people choose sustainably produced foods over conventional foods. Though organic foods are just one category of foods under the sustainability umbrella, a 2006 survey by the consumer research firm, Hartman Group, found that health reasons and nutritional needs are primary reasons that consumers choose to buy organic foods, but consumers also want to avoid pesticides, chemicals, antibiotics and genetically modified organisms.[1] Is the consumer correct in believing that organic and other sustainably produced foods offer a nutritional edge over their conventionally produced counterparts?

As one might suspect, there is not a simple answer. How healthy a food is for a person depends on their overall diet and state of health. The quality of a food's nutrition depends on many factors including how and for how long it is stored and whether it has been processed in any way. Whether a food is fresh, whole, frozen, thawed, steamed, dried or combined with additional ingredients (salt, fat, sugar, added vitamins and minerals) can all impact nutrition quality. In short, whole, fresh, in season, unprocessed foods are generally more nutritious than packaged and processed foods. Beyond that, the method by which the food is raised (local, organic, grass-fed, etc) may also have some effect on nutrient content.

Plant Foods

When it comes to sustainable plant foods most of the debate about the nutritional value stems from whether or not a plant food was organically grown. A number of studies have examined the question of whether organic foods are healthier with conflicting results.

The researchers at the Organic Center (TOC)—an American nonprofit that conducts scientific research on organic products—say that organically produced fruits and vegetables are on average more nutritious than their conventionally produced counterparts. According to TOC's 2008 review of the current literature there appear to be two mechanisms responsible for the difference.

1. **Pest Pressure**[2,3,4,5,6] - When plants are under stress from pests, they produce a diverse array of natural chemicals called secondary plant metabolites (SPMs), many of which are antioxidants. SPMs also are responsible for giving fruit and vegetables their bright coloring and distinctive flavors. Plants on organic farms typically have to deal with higher levels of pests than plants on conventional farms, where pesticides are routinely applied. For this reason, plants on organic farms more fully engage their innate defense mechanisms, and in doing so, elevate antioxidant concentrations.

2. **Dilution Effect**[7,8] - Antioxidant levels tend to be higher in organic fruit and vegetables because plants on organic farms tend to grow slower and mature at a smaller size than fast-growing, heavily fertilized conventional produce. This explanation has its roots in the "dilution effect," which is the tendency for vitamins, minerals and antioxidant levels to be reduced – or diluted – in large, fast-growing and high-yielding crops.

In contrast to TOC's review, a 2009 study[9] funded by the United Kingdom's Food Standards Agency (FSA) —a British government department—reviewed the same pool of literature as TOC but used different methodology and came to markedly different conclusions. The FSA study concluded that there are no significant differences in the nutritional quality of organic and conventional food.

How is it that two groups of scientists can look at the same set of research and come to different conclusions? TOC claims that one of the main differences is in antioxidants. Antioxidants are substances that may protect cells against the effects of free radicals. Free radicals are produced normally in the body but also by exposures to things in the environment such as radiation or tobacco. Free radicals can cause cell damage and may play a role in disease processes such as cancer.

While the TOC review included total polyphenols and total antioxidant content -- two measures of the amount of antioxidants in foods -- the FSA chose not to include those measures. Do varying antioxidant levels make all the difference in the debate over the nutrient content of sustainable foods? More research is needed on the human health impacts of consuming products with higher levels of plant antioxidants and on organic and conventionally raised foods before that can be answered with certainty. For now many who do not find the current nutrient research convincing still choose organically grown produce over conventional produce for other reasons such as avoiding pesticides and genetically modified organisms, and protecting the environment.

Animal Foods

While there have been years of controversy surrounding nutrition and sustainable plant foods, there tends to be much more consensus about the nutritional superiority of sustainably produced animal foods.

Beef

The most comprehensive study to date on the nutritional benefits of grass fed beef was a 2009 collaboration of researchers at the USDA and Clemson University. Their study found that grass fed beef is lower in total fat, higher in beta-carotene, higher in vitamin E (alpha-tocopherol), higher in the B-vitamins thiamin and riboflavin, higher in the minerals calcium, magnesium, and potassium, and higher in total omega-3s. Additionally, they found that grass fed beef contains a healthier ratio of omega-6 to omega-3 fatty acids and is lower in the saturated fats linked with heart disease.[10]

Eggs

Eggs from chickens that have been raised on pasture have been found to contain 10% less fat, 34% less cholesterol, 40% more vitamin A, and four times more omega-3 fatty acids compared to the standard values reported by the USDA for commercial eggs.[11] Additionally, Penn State researcher Heather Karsten found that when she compared chickens raised on pasture to chickens raised on an industrial diet that there was "about twice as much vitamin E and 40 percent more vitamin A in the yolks of pasture-fed birds than in the caged birds. The longer the animals were on pasture, the more vitamins they produced."[12]

Dairy

As with nutrient differences that have been observed in the meat of grass fed cows versus grain fed cows, researchers have observed similar differences in their milk and dairy products. This is due to the fact that living grass is far richer in vitamins E and A, and in the antioxidant beta-carotene than the typical grain based diet of dairy cows.[13] It is important to note that not all organic milk comes from grass fed cows. Requirements for organic milk state that cows must have "access to pasture." However, this standard does not require a specific length of time in pasture. Thus a cow can graze in pasture for a limited time and still produce milk that is certified organic. Also, like the dilution effect seen with nutrients in plant foods that are forced into high yields, some researchers have found a similar effect with milk of cows treated with hormones to increase their milk production. Thus, the more milk a cow produces, the more diluted the vitamin content of her milk becomes.[14]

When exploring the topic of nutrition content and sustainable foods it is important to remember that levels of vitamins, minerals, fats, antioxidants and other nutrients should not be where the conversation ends. Sustainable foods have benefits for the environment, for farmers and farm workers, pesticide reduction, for fighting antibiotic resistance and for taste, all of which impact our health and collective well-being.

Kip Slaughter for the Sustainable Food Committee at Emory University

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Pesticides and organic foods

Should we worry about pesticides in food?
Pesticides are chemicals (insecticides, herbicides, fungicides, and rodenticides) used to kill agricultural and livestock pests. They can be found in many different types of foods, from fresh fruits and vegetables to processed grain products. Insecticides are also used to kill mosquitoes and other vectors of human disease. Because many insecticides can be toxic to the human brain, we worry about pesticides in the food supply. Washing and peeling can help lower levels of pesticides consumed, but not in all cases and more studies are needed.[1,2]

Although pesticide levels in the U.S. food supply are generally below existing federal limits, scientists and regulators are still concerned about exposure, especially during pregnancy and early childhood. Many pesticides can be passed through the mother's blood to the baby during pregnancy. A growing body of evidence shows that exposures during this critical period of brain development are associated with adverse health outcomes such as poor reflexes and poor performance on cognitive tests. There is also some health concern over certain fungicides and herbicides, although research on these is currently limited.

Several large studies are examining the effects of pesticide exposures during pregnancy and early childhood in places like California and New York City where pesticides are used extensively for agriculture or household pest control. These studies have produced several important discoveries about pregnancy exposures and their effects. Findings show that children born to mothers with high levels of certain insecticides in their blood or urine perform poorly on movement, intelligence, and behavioral tests compared to children born to mothers with lower levels.[3,4,5,6,7] These findings persist even after other factors affecting children's brain development, such as maternal education, are taken into account.

Does "organic" mean the food is pesticide free?
An organic label does not guarantee a food is pesticide free. Many foods (and soils, animals, and humans) around the world have measureable levels of organochlorine insecticides such as DDT, hexachlorobenzene, and chlordane, even though they are banned in most countries, including the U.S. These are called "persistent pesticides" because they take hundreds of years to degrade.

Some pesticides legally used in agriculture or household pest control have been detected in foods labeled "organic." Researchers at the Rollins School of Public Health measured low levels of organophosphorus and pyrethroid insecticides in certified organic foods taken from Atlanta residents' homes.[8] Other U.S. studies have also found pesticides in organic foods, although generally at lower levels than in conventional foods.[9] Food may be contaminated at the store, when it is purchased and transported home, or at home when it is prepared for consumption. Experimental studies show that pesticide residues from kitchen surfaces can also contaminate foods.[10,11]

Are there "organic" pesticides?

Production, marketing, and use of pesticides is controlled by the U.S. Environmental Protection Agency (EPA). EPA and USDA maintain a list of pesticides allowable under the National Organic Program. These include naturally and microbially-derived pesticides (e.g. acetic acid) and a limited number of low-toxicity synthetic substances (e.g. boric acid and elemental sulfur). The pesticide of last resort for organic producers is Bt, which has been incorporated into conventional crops through genetic engineering and may be losing its effectiveness due to emerging insect resistance.

Is "organic" production safer for farm workers and their families?

Studies show that farm workers and their families can be more highly exposed to pesticides than the general population.[12] The workers can be directly exposed in the workplace and they can also bring pesticides home on their shoes, work clothes, or skin if they do not wash and change first. Agricultural workers typically live, either temporarily or permanently, close to or actually on the farms where they work. Studies show that levels of pesticides in house dust in their homes can be higher than in non-agricultural homes.[13, 14] Although studies cannot say for sure yet whether organic farming is safer for farm workers and their families, it is highly likely that organic farming reduces pesticide exposures compared to conventional farming.

Anne Riederer for the Sustainable Food Committee at Emory University

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Genetically modified organisms (GMOs)

Genetically modified organisms (GMOs) are defined as organisms, with the exception of human beings, in which the genetic material has been directly manipulated in the lab. Genetically modified organisms may alternately be referred to as GM, GEOs, or organisms/food produced through bioengineering.

Corn, cotton, and soybeans are the three major agricultural crops that have relied most heavily on the application of GMO technology. Since 1996, when genetically engineered crops were first planted in the US, this technology has increased exponentially in the US with percent of acreage rising to 85% of corn, 88% of cotton, and 91% of soybean crops planted in 2009.[1] Gene-altered corn and soybeans are now used in two-thirds of processed foods made by US food companies.[2]

Two classes of engineered traits make up nearly all GMO acreage: herbicide tolerance and insect resistance. Roundup Ready soybeans are one example of a crop engineered for herbicide tolerance. Soybean plants containing the Roundup Ready gene (glyphosate tolerance), are not harmed by the application of the herbicide Roundup which can then be sprayed on the field to kill weeds. *Bt* corn is an example of a crop engineered for insect resistance. *Bacillus thuringiensis* (*Bt*) is a bacterium that produces a protein toxic to insects. *Bt* corn has been engineered to contain that toxin in all parts of the plant, thereby killing insects that may consume it.

The application of GMOs to agriculture has allowed farmers to initially decrease use of herbicides and insecticides and to increase profitability. Recent studies have confirmed that Roundup- and Bt-resistant weeds and insects have emerged and overall chemical use has increased[3].Significant long term risks associated with genetically engineered agriculture include the transfer of chemical resistance to wild plants, loss of biodiversity, and the possible health effects of these new genes and gene products on the human consumer. Considerable scientific and public controversy exists around these issues.

To date, scientific study of the associated benefits and risks of biotechnology has been limited, primarily industry-funded, and has sparked significant debate. Advocates of the Precautionary Principle support regulatory decision makers to err on the side of caution when there is scientific uncertainty. To that end, the Ecological Society of America supports the recommendation that environmental release of GMOs should be prevented if scientific knowledge about possible risks is clearly inadequate.[4]

The U.S. Food and Drug Administration (FDA) has repeatedly sided with biotechnology companies, concluding that new gene-altered products are “substantially equivalent” or “virtually” identical to their conventional counterparts. This position has been central for the FDA’s decision to prevent labeling of foods containing gene-altered ingredients. Across the Atlantic, European consumers have shunned GMO cropsand foods made from genetically-altered ingredients. The Food Alliance and the USDA Organic certification programs have followed suit in their stance against GMOs.[5,6]

Critics argue that since the 1996 harvest, the entire U.S. population has been part of an uncontrolled experiment to demonstrate the long-term safety of gene-altered corn and soybeans.[7] Without food labeling it is virtually impossible to do public health monitoring, and individuals suffering unanticipated health effects are likewise unable to assign blame or determine liability.

Controversy also exists around the patenting of genetically modified materials, a legal right that emerged from a US Supreme Court decision in 1980 allowing biotechnology companies and other researchers to experiment, change seeds, and patent the results[8]. Farmers who wish to use patented seeds pay a "technology fee" to the patent holder. The potential for corporations to patent traditional seeds, long in use by farmers in developing countries, presents a challenge to seed availability and farmers' costs. Critics also express concern over the consolidation over the last twenty years of dozens of seed companies into a very small number of corporations that hold seed patents affecting major sectors of the international food supply[9]. Private control of widely-used seeds has also inhibited scientific development of new varieties in public laboratories. Recently, corporate mergers have restricted the availability of thousands of openly-pollinated seed varieties, narrowing the base of agricultural biodiversity.

Bryce Carlson for the Sustainable Food Committee at Emory University

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Food choices and environmental impact: Meat and plant based diets

People have many reasons for choosing what to eat. We may prefer the familiar foods we were raised with ("comfort food"). Some of us are drawn to foods that are highly advertised in the media and readily available. Or we may be drawn to trendy foods that are featured at restaurants and that mark us as sophisticated eaters. Many vegetarians choose their diets out of ethical concern for the lives of animals. Probably, most of us do not choose what we eat with an awareness of how our choices affect the environment and, in particular, the climate crisis. While food choices are a deeply individual matter, the collective impact of our decisions about what to eat is greater than many people realize.

All food is ultimately "solar powered" in that its availability can be traced back to living beings' ability to make use of the sun's energy. But whether a particular food is more closely or more distantly related to the sun's energy can make an enormous difference in how the consumption of that food affects the environment. As a general rule, eating foods that are produced directly through photosynthesis (plants) will require less total energy than will eating foods that are produced by animals who eat plants (meat, milk, eggs). So, one common sense rule of thumb would be that eating a plant-based diet has less of an impact on the environment than eating a meat-based diet. While this rule of thumb is in general a good guide to lowering the environmental impact of our eating choices, the environmental consequences of food choices are actually more complicated than that. For both plant and animal foods it matters considerably where and how the food is produced. Plant foods that are raised with heavy use of fossil-fuel based fertilizers, cultivated with fossil-fuel run equipment, heavily processed, and transported long distances can have a significantly negative impact on the environment, whereas local pastured meat produced according to sustainable practices can enhance the environment through improvements to soil and water quality.

Impact of Conventional Meat Production

- Currently, 1/3 of the world's grain harvest (including 50% of corn and 90% of soybeans) are not consumed directly by humans but are used for animal feed on factory farms.[1]
- These grain crops are primarily grown on large scale, mono-crop farms, highly dependent on fossil-fuel based fertilizers.[2]
- On average, it takes 6 kilograms of plant protein to produce 1 kilogram of animal protein. For beef the ratio is 40 to 1; for pork 14 to 1; for chicken 4 to 1.[3]
- To produce 1 kilogram of animal protein requires about 100 times more water than to produce 1 kilogram of grain protein.[4]
- The current system of livestock production accounts for 37% of methane and 65% of nitrous oxide emissions, two of the most potent greenhouse gases.[5]
- The manure holding pits ("lagoons") of CAFOs (concentrated animal feedlot operations) break down organic matter without oxygen, a process that speeds the entry of methane and carbon dioxide into the atmosphere.[6]

For consumers who want to lower the environmental impact of their food choices, several strategies are possible:

• Reduce the amount of conventionally raised animal protein in your diet, substituting plant-based protein.
• Choose grass-fed or pastured meats. Grass-fed beef requires half the energy input as grain-fed beef and produces significantly less greenhouse gases.[7] Buying locally produced meats reduces the carbon emissions used in transportation.
• Choose meats that are more efficiently produced in terms of energy inputs (for instance, chicken rather than beef).
• For plant based diets, choose organic and sustainably grown foods, which are produced without petroleum-based fertilizers and pesticides.[2] Organic corn requires 1/3 less energy per acre to grow.[8]
• Choose local, organic, and sustainably grown fruits and vegetables to minimize emissions from transportation.

Carol A. Newsom for the Sustainable Food Committee at Emory University

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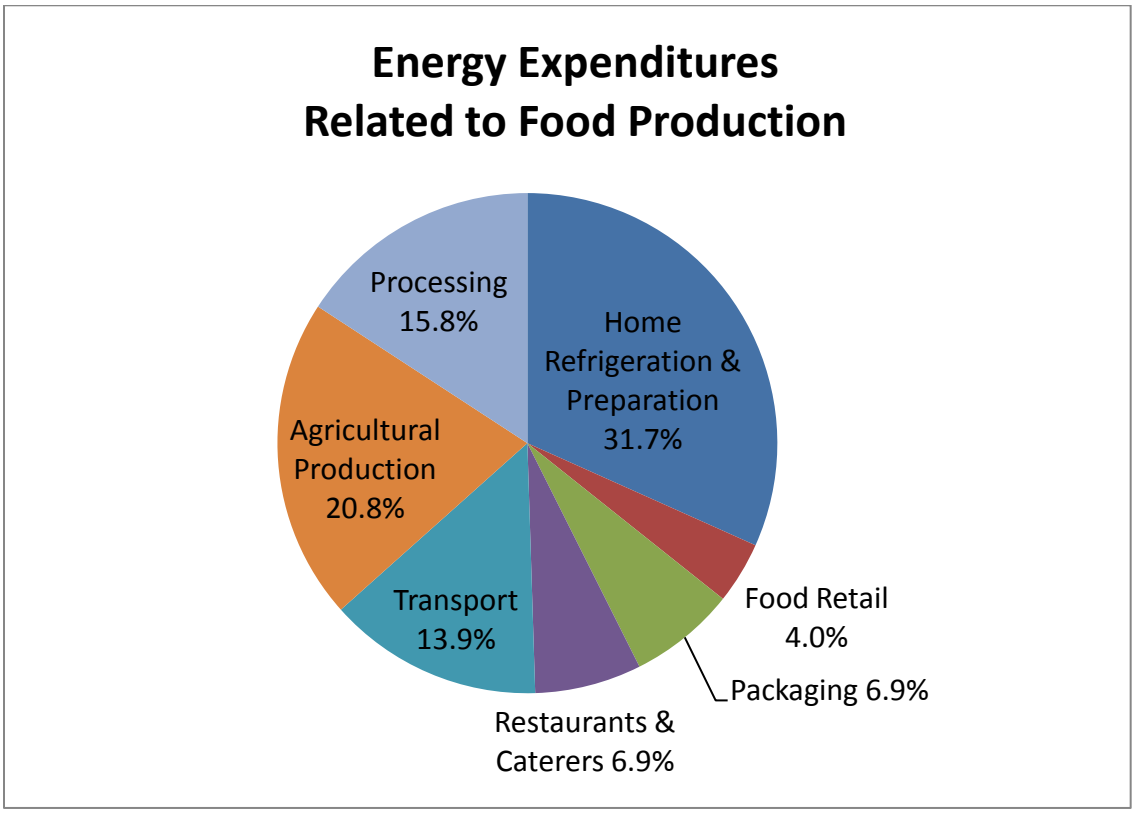
Energy and food production

The American food supply is driven almost entirely by non-renewable energy sources and accounts for approximately 19% of the total use of fossil fuels in the United States. It takes about 7.3 units of (primarily) fossil energy to produce one unit of food energy in the U.S. food system.



Source: University of Michigan, Center for Sustainable Systems (http://www.umich.edu/~css)

This pie chart represents **energy expenditures related to food production** in the United States: home refrigeration and preparation is responsible for about 30%; agricultural production, 20%; transport, 13% percent; and packaging, 6%.

- One tomato can travel over 2,500 miles to end up in the produce aisle at your nearest grocery store. If you buy from local farmers that tomato may only travel about 60 miles.
- By purchasing locally, you can reduce the energy required for transportation.

Fossil fuels and industrial farming

A 2002 study from the John Hopkins Bloomberg School of Public Health estimated that, using our current system, an *average* of three calories of energy were needed to create one calorie of edible food. Some foods require far more, such as grain-fed beef, which requires 35 calories for every calorie of beef produced.[1] However, the study did not include the energy used in

processing and transporting food. Studies that do include such factors estimate that it takes an average of 7 to 10 calories of input energy to produce one calorie of food.[2]

Accounting for most of this wasteful equation are the industrial practices upon which our food system is built. These include inefficient growing practices, food processing and storage, as well as our system of transporting food thousands of miles between the field and the end consumer.

Growing practices

The biggest culprit of fossil fuel usage in industrial farming is not transporting food or fueling machinery; it is the production of chemicals for fertilizers. As much as 40% of energy used in the food system goes towards the production of artificial fertilizers and pesticides.[1] Fertilizers are synthesized from atmospheric nitrogen and natural gas, a process that takes a significant amount of energy. Producing and distributing them requires an average of 5.5 gallons of fossil fuels per acre.[3] Nitrogen-based fertilizers contribute directly to global warming. Making and transporting one kilogram of nitrogen in a fertilizer releases 3.7 kg of carbon dioxide into the atmosphere.[4]

Packaging, processing, and storing food

Approximately 23% of the energy used in our food production system is allocated to processing and packaging food.[4] Another 32% is burned in home refrigeration and cooking.[4] While no study has quantified the potential energy savings of buying locally, the practice of eating whole foods generally decreases the use of fossil fuels for processing, packaging, and storing foods. For example, compare all the energy and packaging behind a can of tomato sauce to simply buying some tomatoes, basil, and garlic, and making it oneself.

Food transportation

As a result of industrial farming, our food is increasingly grown in concentration in specific areas of the country. This is so common that it has shaped much of our country's geographic identities—the western Plains are wheat country, the Midwest is the Corn Belt—but it has reached extremes. For instance, approximately 90% of all the fresh vegetables consumed in the United States are grown in California's San Joaquin Valley.[3]

This national-scale system is possible only because it uses large quantities of fossil fuels to transport food products to the consumer. It is now common practice to ship food not just around the country, but around the world. As a result, the average American food travels an estimated 1,500 miles before being consumed.[1]

Energy inputs in the food production system[5]

The three main purposes for which oil is used worldwide are food, transport, and heating. Agriculture is almost entirely dependent on reliable supplies of oil for cultivation and for pumping water, and on gas for its fertilizers. For every calorie of energy used by agriculture itself, five more are used for processing, storage and distribution.

- Oil refined for gasoline and diesel is critical to run the tractors, combines and other farm vehicles and equipment that plant, spray the herbicides and pesticides, as well as harvest and transport food and seed
- Food processors rely on the just-in-time (gasoline-based) delivery of fresh or refrigerated food

- Food processors rely on the production and delivery of food additives, including vitamins and minerals, emulsifiers, preservatives, coloring agents, etc. Many are oil-based. Delivery is oil-based.
- Food processors rely on the production and delivery of boxes, metal cans, printed paper labels, plastic trays, cellophane for microwave/convenience foods, glass jars, plastic and metal lids with sealing compounds. Many of these are essentially oil-based.
- Delivery of finished food products to distribution centers in refrigerated trucks. Oil-based, daily, just-in-time shipment of food to grocery stores, restaurants, hospitals, schools, etc., all oil-based; customer drives to grocery store to shop for supplies, often several times a week

What you can do[6]

• Buy foods grown locally. The equation is simple: the closer the farm is to you, the less fuel is needed to transport its food to your table. You can find local foods through our Eat Well Guide, by visiting a local farmers market, or by joining a food co-op or Community Supported Agriculture (CSA) group. Ask your grocery store to supply locally grown produce.

• Want to have lettuce that is truly local? Plant a garden and grow your own fresh produce!

• Avoid purchasing processed foods. These foods take more energy to produce and have less nutritional value than whole foods. In addition, choose foods with minimal packaging. This reduces the energy used to produce the packaging and eliminates these materials from the waste stream.

• Cut back on meat. As much as Americans love to eat it, meat is the least fuel-efficient food we have. Large quantities of energy are required to cultivate, harvest, and ship animal feed, house, transport and slaughter animals, process and package their meat, and refrigerate it until it is cooked.

Daphne Norton for the Sustainable Food Committee at Emory University

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Animal welfare and factory farms

Animal welfare is an issue of ethical obligation as much as one of science. It is an ethical concept to which science brings relevant data.[11] In the 1970s, the Farm Animal Welfare Council (FAWC) of Britain stated that "the welfare of an animal includes its physical and mental state and we consider good animal welfare implies both fitness and a sense of well being. Any animal kept by man, must at least be protected from unnecessary suffering".[2] Five Freedoms were outlined.

Five Freedoms

1. *Freedom from hunger and thirst* through access to fresh water and a diet to maintain complete health and energy.
2. *Freedom from discomfort* through the provision of an appropriate environment including shelter and a comfortable place to rest.
3. *Freedom from pain, injury or disease* through prevention, rapid diagnosis and treatment.
4. *Freedom to express normal behavior* through the provision of adequate space, proper facilities and ability to be with animals of the same kind.
5. *Freedom from fear and distress* through conditions and treatment that avoid mental suffering.

Animal welfare has also been described in the context of three equally balanced, related principles.[3] Emphasis on any one principle alone will lead to de-emphasis of the others.

- *Basic health and functioning* – animals should have freedom from disease and injury and should have food, water and shelter.
- *Affective states* – refers to emotions and feelings experienced by the animal such as pleasant or unpleasant.
- *Naturalness* – animals should be able to perform their natural behaviors. There should be natural elements in their environment as well as respect for the "nature" of the animals themselves.

In contrast, a report of the Council for Agricultural Science and Technology (CAST)[4], first published by US agricultural scientists in the 1980s, states that what animals are owed and the extent to which we owe them is whatever it takes to get them to create profit. A productive animal enjoys positive welfare and a non-productive animal enjoys poor welfare. Animals are considered well off if they have food, water and shelter.[1] These opposing views of animal welfare mirror the difference in the lives of animals on small family farms compared to the lives of animals on today's intensive factory farms.

Intensive Factory Farms vs. Small Family Farms

In response to increases in both the population and the consumption of meat products, the US livestock industry has intensified according to a productionist model emphasizing efficiency.[5] Intensive factory farms have replaced small family farms, the relationship between the farmer

and the animals has changed, and the emphasis has shifted from the five freedoms and balanced principles outlined above to one of productivity.

Confinement of large numbers of animals indoors is one hallmark of the factory farm. Indoor housing has eliminated some problems animals may experience when housed outdoors such as extreme weather and attacks by predators, yet intense confinement has created animal welfare problems. Inadequate ventilation, which leads to high levels of dust and the accumulation of irritating gases from the build-up of manure make it difficult to breathe. If the electrical supply is interrupted, the level of heat can build quickly. Concrete and metal flooring can cause slippery conditions, uncomfortable resting places and put stress on hooves and joints causing lameness.[6] This paper reviews the conditions under which selected animals are raised and slaughtered as part of the factory farm business of today.

Poultry

Poultry production is the most highly intensified of all the agricultural industries.[6] The barnyard hen that once provided both the eggs and the meat for the table does not exist on the factory farm. Chickens are raised to be laying hens or broilers in close confinement.

Laying Hens and Confinement Cages

Factory egg farming consists of endless rows of cages (called battery cages) located in long sheds where tens of thousands of hens may be housed in one shed in cages of 3 to 10 hens each.[7] "An egg laying hen requires 290 square inches to flap her wings, yet each bird is allocated an average of only 52 square inches–smaller than a single sheet of paper-in which she sleeps, eats, lays eggs, drinks and defecates."[8] The cages are so small the hens cannot stretch their wings, walk, peck, or scratch the ground. Under these conditions, the hens are prevented from performing natural behaviors such as perching, dust bathing, and laying their eggs in a nest. Inactivity causes claws to grow long and, in some cases, to become permanently entwined in the wire mesh flooring. The slope of the cage floor, designed to allow eggs to roll into a trough for collection, places pressure on the hen's toes causing damage.[7] Feather loss is common from hens rubbing against the sides of the cage.[8]

The stress of crowding and confinement can lead hens to feather peck one another. To prevent this situation, the front third of the beak is removed (called "debeaking" or "beak trimming"). Part of the toes may also be removed so the hens cannot scratch one another. Both processes are performed without anesthesia.[6,9]

To increase egg production in individual hens, food is withheld for a period of 8 to 12 days after the end of the first laying cycle to force molting.[6] This leads to another cycle of egg laying. Once the hen is considered spent, she is killed.

About 1/3 of flocks in the US egg laying industry are affected by "caged layer fatigue." The condition is caused by the continuing demand for calcium for eggshell production, which leaves bones brittle and muscles depleted of calcium. The result is that birds may be unable to stand and reach food and water. This condition occurs in caged birds only and is caused by lack of exercise and exacerbated by crowding.[9]

Male chicks hatched as part of the breeding process for laying hens are considered a by-product of the industry and killed within 24 hours using gas or by placing them alive in a high speed grinding machine.[6] The European Union Council of Agriculture Ministers has banned conventional battery cages beginning in 2012 due to concern about the welfare of the hens.[8]

Broilers

Broiler chickens are raised in windowless sheds where as many as 50,000 birds are quickly fattened over a period of 3 to 12 weeks and sent to slaughter when they reach a market weight of 4 pounds. With nowhere to rest, except on feces-laden litter, the birds may develop breast blisters, hock burns or other skin problems.

Consumer preference for white meat has encouraged raising birds with large breasts. As a result, the birds can become top heavy leading them to fall over and suddenly die (called "Acute Death Syndrome" or "Flip-Over Syndrome").[9] Fast growth in broilers can also be associated with health problems such as ascites (pulmonary hypertension).[6]

Veal

Veal production is considered by many to be the cruelest of all the confinement systems. Young calves are separated from their mothers and placed in wooden crates (called confinement stalls) where they spend 18 to 20 weeks before slaughter. The space is barely larger than the calf, who is also tied at the neck or has his head positioned between parallel bars to further restrict movement. The calf is fed a diet of "milk replacer," a liquid mixture of dried milk products, starch, fat, sugar, antibiotics and other additives. The diet is purposely iron deficient to induce a subclinical anemia to make the flesh as white as possible. Roughage is not permitted in the diet as it could darken the meat. The limited size of the crate assures the animal cannot lick his own hair, urine or feces in an attempt to satisfy his desire for iron.[9]

Swine

Sows (pregnant hogs) are kept in metal bar gestation stalls, known as crates for their entire 4-month gestation period. The small size of the crate does not permit the sow to exercise or turn around. Bedding material is not provided and the sow is forced to stand or lie on a floor made of concrete or slats. The slats allow for manure to fall to the floor below, for easier removal. About a week before the piglets are due, the sow is moved to a narrow "farrowing crate." The crate permits her to stand and lie down, but not turn around. The purpose is to allow her to eat and drink only while keeping her teats exposed for the piglets to nurse.[9]

In a natural environment, sows spend up to 75% of their time rooting in the dirt, foraging and exploring, but confinement prevents these behaviors. The resulting stress leads some animals to demonstrate meaningless repetitive motions, called stereotypies, such as moving their head from side to side.[7]

The diet of the sow is restricted to rations of concentrated feed that provide their nutritional requirements, but lack the bulk required to satisfy hunger. Confinement eliminates the ability to satisfy hunger by seeking additional food. The European Union has banned the use of gestation stalls by 2013 as part of their commitment to animal welfare and sustainable agriculture. (7)

Cattle

Beef Cattle

Cattle raised for beef stay with their mothers and are pasture fed until the age of 3 to 4 months when they are transported to a Confined Animal Feeding Operation (CAFO). There they are fed a high-energy grain diet for 4 to 6 months prior to being slaughtered. Stress from crowding and an unnatural diet adversely affect health. Liver abscesses can occur because the digestive tract is geared toward a diet of roughage and not a steady diet of grain and growth stimulants. Cattle raised for beef may be subjected to de-horning, branding and castration without anesthesia.[9]

Dairy Cows

Most milk produced in the US comes from cows in intensive confinement, commonly tethered to a stall. Increasingly popular are dry lots composed of dirt or concrete lots, devoid of vegetation and often without shade. Partial tail "docking" (amputation) is common practice. Ostensibly performed for the purpose of cleanliness, docking is actually performed to make it easier for workers to milk the cows.[6,9] Docking the tail eliminates the ability of the cow to switch away flies and bugs.

Slaughterhouses

In 1958, Congress passed the Humane Slaughter Act (HSA) and broadened it in 1978 to include regulatory oversight by the United States Department of Agriculture (USDA). One of the most important provisions of the Act is "the requirement that all animals be rendered unconscious with just *one* application of an effective stunning device by a trained person *before* being shackled and hoisted up on the line." When inspectors observe violations, they are required to stop the line until the violation is corrected. Because "down time" leads to loss of money, it is assumed the slaughterhouse will comply. Penalties, however, do not exist for violations, thus the threat of financial loss may supersede concern for animal welfare. Stories exist of violations uncorrected and conditions such as the use of electrical prods, animals dragged through the race (chute) to slaughter, inadequate stunning due to high production quotas, rapid line speeds and animals shackled and hung on the line and skinned while conscious.[9]

Auditing of slaughterhouse practices by some large restaurant chains has begun to lead to change. One study has demonstrated that the degree of stress experienced by cattle can be assessed by measuring the level of vocalization when moving through the chute to slaughter.[11] When cattle are stressed, vocalization increases. Cattle may vocalize and refuse to move forward when they see people up ahead are moving into a dark area, have a sense they are going over a cliff, feel air moving against their face or see shiny objects. When animals balk, workers use electric prods to move them forward. Eliminating the environmental stimuli that cause the animals to balk reduces the need for prods and reduces vocalization.

Alternatives to Factory Farming

The World Society for the Protection of Animals (WSPA) is an excellent resource on animal welfare issues and alternatives to factory farming.[11] Also available are standards for the raising of broilers, laying hens, beef cattle, dairy cattle, pigs and sheep.[12] General industry guidelines are compared to standards for the following certifications:

- Certified Organic (U.S. Department of Agriculture)
- Certified Humane (Humane Farm Animal Care)

- American Humane Certified (American Humane Association)
- Animal Welfare Approved (Animal Welfare Institute) – this is the most stringent of
- the certifications.

Summary

In summary, animal welfare is viewed by some as both a scientific and an ethical issue, while others feel that animal welfare exists if only food, water and shelter are available and the animal is productive. While debate exists about whether the conditions animals experience under factory farming raise ethical or welfare concerns, Emory's commitment to sustainability supports the Five Freedoms.

Lynne Ometer for the Sustainable Food Committee at Emory University

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Grass-fed livestock

The sustainability of grass-fed versus conventionally raised livestock may be compared across three major domains:

1. Environmental impact
2. Human health
3. Cost

Environmental impact

Renewable vs. non-renewable energy inputs. Conventional production relies on heavy inputs of fossil fuels in the production of fertilizer and use of machinery to maximize yields of grain, which are in turn fed to livestock. Grass-based systems, in contrast, utilize solar energy to produce grass with minimal input of fossil fuels. Total energy input (largely from fossil fuels) for conventional systems are approximately 60% higher than for pastured livestock.[1]

Agroecological balance. Conventional production often removes animals from the farm in favor of confined animal feeding operations (CAFOs). Within this system, animals are raised on a grain-based diet, producing manure at levels much greater than the surrounding land can absorb.[2] In grass-based systems, animals are raised on the farm in numbers supportable by the farm. Additionally, pastured livestock often contribute to the overall health and balance of a farm by consuming grass from land unfit for crops or by-products of harvested crops otherwise wasted.

Miscellaneous. The stomachs of livestock species have evolved to digest and absorb nutrition from grass. However, when raised on a largely grain-based diet many livestock develop acid reflux, abscesses within the gastrointestinal tract, and chronic infection.[3] In addition to positively affecting the animal's health relative to a conventional grain-based diet, livestock raised on pasture provide the additional environmental benefit of decreased soil erosion and increased soil fertility, and improved water quality as a result of decreased pollution.[4]

Human health

Fatty acids. Grain-fed beef is fattier and more highly concentrated in the saturated fats most often associated with heart disease, diabetes, stroke, and cancer. In contrast, grass-fed beef is leaner with a greater percentage of omega-3 fatty acids, those least associated with disease.[5]

Antibiotics. The Union of Concerned Scientists estimates that over 70% of antibiotics produced within the U.S. are used in animal production to minimize infectious disease and optimize rates of growth.[6] The systematic administration of antibiotics is most common in the conventional system where the spread of disease between confined animals is a constant danger. Many of these drugs are similar to human antibiotics and their continued use within industrial animal production fosters antibiotic resistance.

Cost

True costs. While conventionally raised meat and dairy products remain significantly cheaper than grass-based products, the true costs remain hidden. Consumers pay for these products in

several ways beyond the grocery store, including tax dollars that subsidize the production of grain, increased health care costs, and ecological degradation and pollution, to name a few. These are costs not associated with grass-based systems for the production of meat and dairy, but are generated by the conventional production of livestock based on grain. These costs are not borne by the industry and passed directly to the consumer. They are passed indirectly to everyone as governmental agencies foot the bill for sewage, water treatment and environmental cleanup. As a result, the choice to purchase or consume meat and dairy from grass-fed systems shifts the market away from a system in which the true costs of production are hidden.

Bryce Carlson for the Sustainable Food Committee at Emory University

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Sustainable seafood

Health of the Oceans

We are currently in the middle of, and responsible for, the largest mass extinction of species on Earth since an asteroid wiped out the dinosaurs nearly 65 million years ago. Expert scientists estimate that 50% of Earth's species will have vanished within the next 100 years. Nowhere is this trend more evident than in the oceans.

National Oceanic and Atmospheric Administration statistics indicate that each quarter since reporting began in 2005 our fisheries have become more overfished and less sustainable. Yet regular fish consumption is recommended by medical and health practitioners to reduce risk for a number of chronic diseases.

Growing concern over the health impact of mercury contamination in wild and farmed fish has stimulated questions about the risks and benefits of consumption. It is the most toxic non-radioactive material on Earth, and poisoning results in impairment of vision, touch sensations, lack of coordination of movements, impairment of speech, hearing, and walking.[1] Mercury concentrations within wild and farmed fish differ by species and method of production or harvest. Carnivorous species are most highly contaminated, while those species lowest on the food chain are least concentrated in mercury. As a result, optimal health benefits accrue to those individuals making choices that minimize intake of highly contaminated species and consume lower on the aquatic food chain.

Health of the Consumers

Studies of the costs and benefits of fish consumption reveal that moderate intake of 1-2 servings per week reduce the risk of heart attack, stroke, coronary death and total mortality.[2] Numerous epidemiologic studies have also reported that fish consumption may protect against some cancers, asthma, diabetes, rheumatoid arthritis and other inflammatory diseases, Alzheimer's disease, depression, and macular degeneration.[3]

Seafood Watch: Monterey Bay Aquarium

The Monterey Bay Aquarium has targeted regional species whose fisheries generally fall in line with sustainable practices.[4] Practices are assessed with reference to a number of factors including -- but not limited to -- habitat damage, bycatch, overfishing, and impact of practices upon the local environment. These reports are compiled to formulate recommendations for "best choices", "good alternatives", and those items to "avoid".

"Best choices" for Southeast consumers include: Pacific Cod (wild longlined), Pacific Halibut, Salmon (Alaska, wild), Tilapia (US farmed), and Tuna: Albacore (US).

Species to "avoid" in the Southeast include: Caviar (Sturgeon, imported wild), Cod (Atlantic), Mahi mahi, Orange Roughy, Salmon (farmed, including Atlantic), Shrimp (imported), and Tuna (Bluefin, canned)

Marine Stewardship Council

The Marine Stewardship Council offers official certification for fisheries and producers of sustainable seafood.[5] Consumers can be sure that seafood carrying the MSC label comes from a certified sustainable fishery, that each business along the supply chain has undergone a traceability audit, and meets best practice guidelines set forth in the MSC standards. Where the Monterey Bay Aquarium offers general guidelines at the species level based on common practices for each region of the United States, the Marine Stewardship Council certifies specific fisheries in compliance with their standard for sustainable fishing and tracks each product from harvest to consumer.

Bryce Carlson for the Sustainable Food Committee at Emory University

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Choosing local food

What is "local"?
There is no universal definition for "local" food. Many people use a 100-mile radius to define local.[1] Emory has defined local in two tiers to meet our sustainable food initiative goals for purchasing: 1. Georgia, and 2. the eight-state Southern region including Florida, South Carolina, North Carolina, Tennessee, Kentucky, Alabama, and Mississippi. When possible, food is purchased from within Georgia, but the broader region recognizes the limits of the Georgia growing season.[2]

Benefits of local food
Economic
Buying local food keeps dollars circulating in the local community. Getting to know the farmers who grow your food builds relationships based on understanding and trust, the foundation of strong communities. Independent, family-owned farms supply more local jobs and contribute to the local economy at higher rates than do large, corporate-owned farms. However, it is important to remember that local food can be produced on farms of any scale.[3]

Shopping at farmers markets and farm stands or joining a farm's Community Supported Agriculture (CSA) program are ways to purchase directly from the farmer. Consumers can promote the local food economy by asking grocery store managers if they sell any local food items and encourage them to do so if they do not already. Restaurant goers can patronize restaurants that utilize local food and support local farmers.

Freshness
Most fruit and vegetable varieties sold in supermarkets are chosen for their ability to withstand industrial harvesting equipment and extended travel, not taste. Since local food does not have to be transported long distances, local farmers can offer produce varieties bred for taste and freshness rather than for shipping and long shelf life.[3]

Health
Knowing where food comes from and how it is grown or raised enables the consumer to choose food from farmers who avoid or reduce their use of chemicals, pesticides, hormones, antibiotics, or genetically modified seed in their operations.[3] However, not all local farmers avoid such practices as pesticide use or supplementary hormones, so it is important to buy food from farmers who produce food in a manner that is consistent with your values.

Environment
Local food does not have to travel far. This reduces carbon dioxide emissions and packing materials. However, some food that is grown locally may be transported long distances for processing. Buying local food also helps to make farming more profitable and selling farmland for development less attractive. Consumers vote with their food dollar when they purchase local food. This ensures that local farms will continue to thrive.[3]

Where to find local food

Georgia Organics has several resources for consumers looking for locally grown food. Their Organic Directory and Local Food Guide (http://georgiaorganics.org/organic_directory/) lists Georgia farmers' markets, CSAs, and businesses that promote local and sustainable food.[4] They also have a Google Map of their Local Food Guide that easily provides driving directions to farms and CSA locations, farmers' markets, restaurants with local food, and grocers and specialty retailers.[5]

Summary

Purchase and consumption of local food has numerous benefits. However, the production of local food does not necessarily include sustainable farming practices or ethical treatment of farm workers. Local food is not automatically fresher or better for the environment.[6] Local food can be produced on large conventional farms, but building relationships with local farmers to learn about their growing practices is the best way to ensure that your local food is grown in a sustainable and ethical manner.

Emily Cumbie-Drake for the Sustainable Food Committee at Emory University

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Sustainable food purchasing and the Georgia economy

Buying local food can contribute to local economies and Emory's investment in Georgia-grown and –raised foods has positive implications for job growth across the state.

Georgia's agricultural economy

Between 1945-2007, the number of farms decreased by almost 80%. The average farm size in Georgia doubled from 105 to 212 acres, though many commercial farms top 500 acres. Georgia farmers earned $546 million less from food production in 2006 than they did in 1969 (dollars adjusted for inflation).[1] Currently, Georgia consumers purchase $19.9 billion of food each year, of which $16 billion is purchased from out of state[2], reflecting global changes and an increasingly centralized food production and distribution. The number of egg and poultry farms has increased in Georgia[3], while the number of farms selling fresh vegetables has decreased.[3] Georgia farm income has declined approximately 6.4% since 2002.[4]

In summary, the decrease in the number of farms and the ability to purchase food more cheaply from outside the state or from overseas has had a negative impact on Georgia's agricultural economy. Continued reliance on conventional agriculture does not present an optimistic scenario for state economic health.

Trends and consequences to communities

The trend for many decades has been to replace human labor with machinery, to reduce labor costs, and allow farm families to operate more acreage. Interest rates for land and equipment make farmers vulnerable in price downturns, and economic challenges have led many viable large-scale family farms to be unable to continue in farming in the next generation.[5] At present, the average age of Georgia farmers is 58. The loss of commercial farms has consequences for the Georgia economy. For example, when Georgia dairy farmers quit farming, Georgians begin to import milk from other states.[6] Furniture stores, local banks, and car dealerships all suffer when the farm economy contracts.

Small-scale farms are more likely to employ human labor and rely less on machinery. Small, independent farms, shops and restaurants are more likely to sell locally-made products to the community.[7] Investing in local agriculture can be good news for rural development. A study by Ohio State University of one county near Columbus, Ohio, found that with a 10% increase in purchases of local foods in grocery stores and restaurants, the county could expect to see 243 new jobs, increased tax revenues of over $300,000 and almost $4,000,000 added income to local residents.[8] Wages paid at every stage, from production, to processing, to retail, benefit the workers and their local economy.

Economic barriers

The primary challenge Georgia's smaller-scale farmers and food producers report facing is distribution. Farmers are able to grow the food, but demand still outweighs supply due to logistical problems and insufficient information among producers. Marketing and transportation are costly and difficult, small-scale producers are rarely able to assume the cost of required

liability insurance, and farmers are not confident that they can sell what they grow when consumers can buy produce from Mexico more cheaply.[9]

Georgia's fishing industry also faces challenges in distributing product to buyers in the north and west parts of the state. Many of Georgia's small, independent, family-owned fishing businesses cannot afford the cost of moving their product inland, when interstate commercial truckers are willing to come directly to the docks.[10] If Emory, a major food service provider in Atlanta, demands local and fresh seafood and other products from the rural counties, we can encourage specialized food distributors to supplement the cost of liability and transportation.

How Emory can impact Georgia's economy

Local food systems support small farmers, especially in rural communities where farmers have difficulty connecting to customers. Emory understands the physical and economic barriers to moving Georgia produce from rural farms and fisheries to our urban campus. Our commitment to purchasing Georgia-grown and –raised foods 1) assures farmers, especially of small- and medium-scale farms, that their produce has a market, and 2) encourages investment in processing, distribution, and retail of Georgia-grown and –raised foods. The largest employer in Dekalb County, Emory served 1.1 million meals in 2009. As Emory partners with state and local entities to tackle and solve supply and distribution problems, the entire state can benefit. As the number of small farms and farmers markets continues to expand in metro Atlanta, access to fresher, local produce expands as well.

Stacy Bell for the Sustainable Food Committee at Emory University

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