

Social and Environmental Issues in Agriculture

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INTRODUCTION TO PART 3

Social & Environmental Issues in Agriculture

People become interested in organic farming and gardening for a variety of reasons: to grow food in a more “natural” manner; to improve food security in urban neighborhoods; to open up new markets; to work with youth in organic school gardens; to take action to create a more sustainable future. As part of that interest, many seek to be active players in creating a food system that is more environmentally sound, economically viable, and socially responsible, and that will serve as a foundation for future generations.

Creating a more sustainable food system requires understanding the existing food system. What is it? How did become what it is? What are the consequences of its current structure? What has already been done to change it? These are the questions that are addressed in the following four units.

Unit 3.1 includes three lectures. The first two explore the history and development of the U.S. food system. They outline the rapid rise from subsistence farming to agricultural globalization, and detail the primary factors that have influenced the food system’s current shape. The third lecture defines a food system, and provides a snapshot of its many features as they exist today.

Unit 3.2 chronicles the social impacts and workings of the current system. Three major themes are explored in two lectures—labor, concentration, and health.

Unit 3.3 examines the most common practices used in conventional agricultural production, and the major agricultural, environmental, and human health concerns that have emerged as a result of their use over the past century.

Unit 3.4 outlines the various resistance movements that have arisen to oppose the conventional U.S. agricultural system. These struggles and resistance movements started, along with larger changes in the agricultural system, in the mid 1800s. The first two lectures examine the resistance to the agricultural system, and the third lecture more specifically outlines social justice-related activities.

Along with the specific learning objectives for each section, it is hoped that through these lectures students will come to understand that the current U.S. agriculture and food system did not just “spring up.” Human decisions and actions, along with environmental contexts, led to the system we see today. Understanding why we are where we are, and what has gone before us to make change, is a first and critical step to understanding how to contribute fully to the larger effort of creating a more sustainable food system.

The Development of U.S. Agriculture

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Introduction: The Development of U.S. Agriculture

UNIT OVERVIEW

To better understand the current food and agriculture system, we need to see where it comes from and how it developed. This unit provides students with this historical context for current issues in the U.S. agriculture and food (agrofood) system. It chronicles the comparatively rapid rise from subsistence farming to agricultural globalization. It shows the many factors that influenced the shape of the system today—including political, economic, social, ecological, and technological factors, innovations, and failures.

The first lecture begins with an outline of general trends in the development of the United States agrofood system. The ways in which historical land use practices, settlement policies, and labor management practices have influenced agricultural development in the U.S. are then covered, followed by an outline of the increasing emphasis on science and technology-intensive inputs that characterizes much of U.S. agriculture. This includes an overview of the federal policies responsible for the development of the U.S. agricultural research complex. This complex has generated the innovations in agricultural technologies that have shaped both the production and processing of food and fiber in America.

The second lecture begins with a discussion of the ways in which large-scale capital investment, enabled by advances in agricultural science and technology, has entered U.S. agriculture, and the structural changes that have resulted. Corn is examined as a case study of how science, capital, and policy interact in the context of agricultural development. The lecture next outlines the effects of the confluence of policy, technology, and capital on agricultural development. These effects are overproduction and surplus, the cheap food policy, and the technology treadmill. Finally, the lecture explores how these themes play out globally, to understand the larger context within which the U.S. food system operates.

The third lecture focuses on the current U.S. food system. It starts by defining what a food system is, then provides a snapshot of what is happening in its various components.

MODES OF INSTRUCTION

> (3 LECTURES, 50 MINUTES EACH)

Lectures 1 and 2 cover the historical development of the U.S. food and agriculture system, focusing on the circumstances that have been largely responsible for its current structure. Lecture 3 focuses on the current food system. References given in the lecture outlines are described in the References and Resources section.

LEARNING OBJECTIVES

CONCEPTS

- The history of U.S. agricultural development, from before the Common Era (pre-A. D.) to the early 1700s
- The changes in control over the means of production (land, capital, and other resources) in the U.S. food system from approximately 1900–2000
- The way that historical land use practices, land settlement policies, and labor management strategies have influenced U.S. agricultural development
- U.S. federal policies that have been responsible for the development of the U.S. agriculture research complex and the innovations in technologies that have shaped the direction of U.S. agriculture
- The influence of investment capital on the adoption of agricultural technologies and the concentration of ownership in food and agriculture
- The food system is composed of a supply chain—production, processing, distribution and consumption—but it both impacts, and is impacted by a broader economic, political, social and environmental context

Lecture 1: History & Large-Scale Changes in Agriculture & the Food System

A. Early U.S. Agriculture

- 1) Pre 1600s
 - a) Native Americans, in the North American region of the continent, were possibly farming as early as 5000 B.C.
 - b) By A.D. 800, corn or maize was considered one of the most important crops
 - c) By A.D. 1000, many Native Americans were cultivating corn, beans, and squash – a staple that is considered to provide a steady food supply for villages
 - d) Tobacco was another common crop. Foraging and hunting were also food generation strategies.
 - e) Land tenure was generally held by the village claiming sovereignty over an area. Some tribes allowed individual control of fields within these regions. In some villages, this control was passed down to family members, generally from mother to daughter.
- 2) 1600s
 - a) Most early colonists were not farmers, and not here to farm. Many were religious dissenters, adventurers, or those seeking fortune. Even those that did intend to farm found conditions different than what they were used to. However, community survival depended on learning to farm.
 - b) Agricultural practices were mostly learned from Native Americans – particularly growing corn for food and tobacco to trade. Other common crops grown include beans and squash as staples. Wheat was common in the middle colonies, and cattle in the north.
 - c) Technology consisted primarily of few tools, such as the ax and hoe. Plows were often scarce or homemade.
 - d) These hand-intensive crops relied on lots of labor, which was primarily from large families in the North (where religious groups came as families), and indentured servants and slavery in the South. Indentured servitude made up the primary labor for the tobacco growing regions of Maryland and Virginia during this time.
- 3) Early 1700s
 - a) Meat production became more in demand, and corn was used to feed both people and animals
 - b) Regions became specialized in what they produced. Other grains became important for feeding cities (wheat in particular). Tobacco, rice, and indigo became primary crops in the South.
 - c) Labor trends changed, with slavery becoming more established and indentured servitude decreasing
 - d) Technology still consisted primarily of hand tools. A sickle or cradle scythe was used to harvest grains—which one skilled person could use to harvest 3 acres in a day.

B. Large-Scale Changes

1. Land use and settlement (see Cochrane 1993, chapters 4 and 5; Hurt 1994; Walker 2004)
 - a) Agriculture was the dominant land use and economic activity of the early United States
 - i. >90% of U.S. populace was involved in agriculture pre-1900
 - b) Early U.S. government considered land its most abundant resource
 - i. Native Americans' rights to land were not acknowledged and lands were taken from them

- c) During the revolutionary war and shortly after, colonists view of land tenure changed
 - i. They considered land as no longer just being held by the king of Great Britain, a small group of English noblemen, and a handful of men granted large tracts of land by the English nobility. The colonists decided that states and the federal government were to have control of how to distribute the land.
 - d) Encouraged extensive agricultural development
 - i. Since land was considered to be a nearly limitless resource, farmers had few incentives for soil conservation or long-term soil fertility management
 - ii. Effect: Exploit native fertility until depleted, then move on to more fertile soils
 - e) Early federal land settlement and development policies had several effects
 - i. The landscape to the west of the Appalachian mountains was quickly populated with people from the East engaged in agriculture
 - ii. Native Americans were displaced by military force, treaties, and federal policy, establishing the reservations on fractions of the land they once occupied
 - f) Key early federal land settlement and development policies
 - i. Several early policies for land distribution favored the conservative trends, mostly enabling only speculators with abundant resources to buy land and re-sell tracts at higher prices (Ordinances of 1784 and 1785; Act of 1796; Act of 1800, etc.)
 - ii. The Homestead Act of 1862 allowed for any “head of a family or [21-year old]... citizen of the United States” (or who had the intention of becoming a citizen) to gain access and eventual ownership (within five years’ time) of up to 160 acres of “unappropriated public lands” for a low fee, providing that the individual resided upon the land
 - The Homestead Acts drove the transformation of land into agricultural uses, and, in combination with the development of the transcontinental railroad system, extended reach of the United States westward
 - Though the Homestead Act did not technically exclude African-Americans, Native Americans, or women from taking advantage of this opportunity, given the social and political realities of the time, White males were the primary targets for the program
 - A number of related acts and amendments followed the Homestead Act of 1862, each allowing the possibility for land grants to individuals, and driving U.S. agricultural development. These included The Southern Homestead Act of 1866, the Timber Culture Act (1873), and others during the early part of the 20th century.
 - iii. Railroad land grants established infrastructure for distribution of food, fiber
 - iv. Reclamation Act (1902): Irrigation projects opened up vast tracts of the Southwest and California for agriculture
 - v. Exceptions: California, Southern U.S.—characterized by large landholdings and thus a form of large-scale capitalist agriculture (vs. individual small-holdings in other parts of the country) from the very beginning (Walker 2004)
2. Agricultural labor (see L. Jelnick 1979; M. Wells 1996; McWilliams 2000; Walker 2004 ; Hurt 1994)
- a) Slavery (1619–1865): Enabled exception to small-scale, family-scale farming that characterized much of early U.S. agriculture. Slavery allowed for large increases in the scale of production.
 - b) Post-slavery, sharecropping was common in the South. In this system, tenant farmers were allowed to use the land, and received a percent of profits from the crop they grew. Sharecropping generally kept farmers in debt and poverty. Immigrants were brought in to fill the need as African-Americans started working in other industries (National Farm Worker Ministry, n.d.).

- c) Immigrants were increasingly recruited to work in agriculture as wage laborers. Policy changes led to a succession of ethnic groups being recruited:
 - i. Chinese immigrants were brought in as laborers until the Chinese Exclusion Act of 1882 prohibited immigration
 - ii. Filipinos were brought in as farm laborers until they began to organize in the early 1930s
 - iii. Japanese laborers were brought in as farmworkers and worked in that role until Japanese were sent to internment camps during WWII
 - iv. Mexican laborers were recruited at several distinct points, including WWI; during the Bracero Program (1942–1964), a series of agreements between the Mexican and U.S. governments allowed temporary importation of Mexican workers into the U.S. Mexican laborers were deported or encouraged to leave when white U.S. farmers bankrupted by the dust bowl of the 1930s migrated west and became farmworkers (National Farm Worker Ministry, n.d.).
 - v. Waves of immigration resulted in a continuous supply of low-wage workers with little status or political power to influence working conditions (L. Jelnick 1979; M. Wells 1996 ; McWilliams 2000; Walker 2004). (see Unit 3.2, Social Issues in Current U.S Agriculture, Lecture 1 for more information on impact to workers.)
- 3. The development of scientific agriculture (see Cochrane 1993, chapter 7; Hurt 1994, chapter 7; Hightower 1973, chapters 1–2; Gardner 2006, chapter 2)
 - a) Pre-1860s
 - i. Agricultural innovation and knowledge exchange were hands-on and farmer-to-farmer
 - ii. Agricultural knowledge and innovation were created on-farm
 - iii. Basic agricultural techniques and yields per acre had reached a plateau
 - iv. Most agricultural labor was done by hand
 - b) Federal policies established the scientific agricultural enterprise, which moved knowledge production from the farm and farmers to the university and scientists
 - i. U.S. Department of Agriculture was established in 1860 and devoted to improvement of agriculture based on scientific inquiry
 - ii. Land Grant Colleges of Agriculture were established to conduct research and development—Morrill Act (1862, amended 1890)
 - iii. Agricultural experiment stations were established to work on practical agricultural problems—Hatch Act (1887)
 - iv. Cooperative Extension service was established to diffuse innovations to farmers—Smith-Lever Act (1914)
 - v. The Secretary of the Interior was authorized to develop irrigation and hydropower projects in 17 arid Western States—Reclamation Act (1902)
 - vi. Agricultural economics were included within the research agenda of land grant universities—Adams Act (1920s)
 - c) Some key technological developments derived from the scientific agricultural enterprise that spurred significant increases in total and per capita productivity
 - i. Mechanization—in particular the tractor—spurred large early increases in productivity
 - New improvements in the 1930s led to the tractor’s escalating adoption. By the 1950s, the use of the draft horse and mule were negligible.
 - Tractors allowed for more acreage to be cultivated. During WWII, tractors made it possible to add 9 million acres of corn and 2 million acres of wheat to U.S. farming production.

- ii. Hybridization—both plants and animals
 - The first hybrid corn was commercially produced in the 1920s. It allowed the yield per acre of corn to double or triple and was adopted widely by the 1940s.
- iii. Chemical pesticides (insecticides, herbicides, and fungicides) and synthetic nitrogen and phosphorus fertilizers were being developed during the early 1900s and adopted throughout the early and middle century
 - Commercial fertilizer use grew steadily starting in 1900, with a big jump in the use of synthetic nitrogen in the 1950s and 1960s (Gardner 2006, p. 22–24)
 - Chemical pesticides became widely used after WWII; many were a product of weapons development (Gardner 2006, p. 24–25)
- iv. Reclamation and irrigation of the arid West increased productive capacity enormously
 - This effort started in 1902 with the Reclamation Act. Reservoirs, irrigation, and other projects were further subsidized during the Depression era, and continued both during and after WWII (Cochrane, p. 225–7).
- v. Continued pressure for extension of seasons to allow for year-round availability of commodities
- vi. The effects of widespread adoption of the above technological innovations in agriculture included:
 - Significant increase in the production and use of mechanization, synthetic pesticides, and synthetic fertilizers
 - Vast reduction in labor requirements on farms, which facilitated major rural-urban migrations and provided more workers for factories
 - Significant and rapid increase in farm size and decrease in the number of farmers that could remain in business
 - Huge expansion of scale of agricultural production
 - Specialization and monoculture production were encouraged; separated crop from livestock production, resulting in the biological simplification of agroecosystems
 - Input production (e.g., seed saving) and processing moved off-farm

Lecture 2: Capital, Politics, & Overproduction in Agriculture & the Food System

A. The Development of Corporate Influence in Agriculture

(see Goodman et al. 1987; Goodman 1991; Kloppenburg 2004; Heffernan 1998)

The impact of capitalism was another major influence shaping the development of the current agriculture and food system

1. There were several historical barriers to the industrialization of U.S. agriculture (see Mann and Dickinson 1978; FitzSimmons 1990, pp. 13–14; Lyson 2004, p. 16)
 - a) The primary barrier is the presence of “nature” in agriculture: The vagaries of seasons and the inability to control environmental conditions. Agriculture does not work the way factories do, where all the conditions can be structured and controlled. This lack of control leads to more risk in investment for businesses.
2. Although production itself had barriers, private capital (businesses) found other roles to play in the food system (see Heffernan 1998; Goodman 1991)
 - a) As technologies of all sorts developed, investment capital moved in to manufacture and distribute them. This includes seeds, fertilizers, tractors, etc.
 - b) Distribution and processing of farm products is the other area where private investment and capital flowed into the food system (Heffernan 1998)
 - i. Railroads were an early private distribution system farmers were dependent upon in the expanding U.S. As farmers moved West, their consumers were still in the East. Farmers depended on railroads to transport their crops.
 - ii. Animal slaughtering and processing, as well as grain storage and processing, were other areas for capital investment
3. The creation of the “Cost-Price Squeeze”
 - a) Competitive advantage is gained by farmers who adopt capital-intensive technologies—and then make more money based on the economy of scale
 - i. For example, those that invested in tractors, hybrid seeds, or fertilizers could get higher yields and make more money
 - b) These technologies increase farmers’ dependence on inputs they must purchase from companies. As the prices of those inputs increase, so do the costs of production for the farmer.
 - c) Increasing private and corporate ownership of the agricultural inputs, food processing, and retail sales sector of the economy begins to appropriate increasing proportion of food dollar, and thus power over the food system
 - d) Farmers are “sandwiched between a monopoly-controlled agriculture input sector and a monopoly-controlled output (processing and retail) sector” (Lobao 1990, p. 27)
 - e) Farmers become “price-takers”—they must take market price set by the small number of corporation buyers, resulting in decreased prices paid and thus dwindling share of the food dollar to farmer
 - f) Farmers gradually lose power, autonomy, economic self-determination
 - i. The loss of economic self-determination shows in recent statistics: Small to mid-sized farms, defined as those grossing between \$100,000 and \$250,000, only had average net earnings of \$19,274 in 2009, and that figure includes subsidy payments (Wise 2011)

4. As sector matures, concentration of input suppliers/processors/retailers into monopolies and oligopolies expands. This dynamic of concentration has been picking up in the last half of the 20th century, but particularly in more recent decades (see Heffernan 1998).
 - a) Industrial consolidation
 - i. Post-harvest transportation and storage: Cargill, Cenex Harvest States, ADM, and General Mills were responsible for 60% of the grain handling facilities as of 2002 (Hendrickson and Heffernan 2002)
 - ii. Processing and value-adding: ADM, Bunge & Cargill, and Ag Processing did 85% of the crushing of soybeans; Cargill CHS, ADM, and ConAgra did 52% of the grain milling as of 2006 (James, Hendrickson & Howard, 2012)
 - iii. Retail: Walmart, Kroger, Safeway, and Supervalu commanded between 42–51% of the market in 2010 (James, Hendrickson and Howard, 2012)
 - iv. Other food industry consolidation in pictorial form: Seeds, organic industry, soft drinks, etc.: See www.msu.edu/~howardp/infographics.html
 - b) Example of consolidation for growers: Chickens (see Unit 3.2, Lecture 2, for examples)

B. Modern Corn: A Case Study in Research, Capital, and Politics in Agriculture

(see Berlan and Lewontin 1986; Kloppenburg 2004; Pollan 2006, section I)

1. The corn seed as an example of the above processes operating in agriculture
 - a) In seed form, corn is both a productive commodity (i.e., grain) and has reproductive capacities (seed)
 - b) Seed is a strategic point of control for capitalist penetration of agriculture: The control of seed = control of the self-sufficiency (or market dependency) of farmers and farming
 - c) The story of modern corn is a story of a struggle for that control; and the use of agricultural research and science as a tool of private capital, facilitated by publicly funded research and policy
2. Pre-1920s: Farmers saved a portion of crop as seed to plant the next year
 - a) Maintained a degree of autonomy from purchased inputs
 - b) High degree of genetic diversity and regional variation
3. Hybridization
 - a) Developed in 1920s by Pioneer Hi-Bred, with help from USDA and U.S. patent protection laws
 - b) Doubled and tripled yields resulted from hybrid seed strains
 - c) Facilitated mechanization of production: Uniform height and maturation time
 - d) Consequence: Would not “reproduce true to type”—forced farmers to buy seed every year
 - e) Almost universally adopted by early 1930s
4. Other factors
 - a) Inexpensive and synthetic fertilizers, along with hybrid seeds, made greatly increased yields possible. Corn needs large amount of nitrogen, and thus farmers were even more dependent on inputs purchased from outside the farm.
5. Contemporary developments in agricultural technology: Genetic engineering
 - a) Further application of agricultural science in the service of private capital
 - b) Created and sold as “technology packages” (e.g., Roundup Ready™ seed and Roundup™)
 - c) Novel methods of intellectual property protection (see Supplement 1, Genetic Engineering in Unit 1.4, Transplanting and Direct Seeding, for more information)

- i. Technology use agreements: Power of seed companies puts growers in a disadvantaged relationship (see Unit 3.2, lecture 2 and Supplement 1 in Unit 1.4). They have to pay much more for these seeds and have limited control of their use (cannot legally replant them, but must buy new seeds each year).

C. Impacts of History of Development: Chronic Surplus, Overproduction, Export Agriculture, and Global Food Trade

(see Holt-Giménez and Patel 2009, Chapter 4; Cochrane 1993, Chapter 8; Friedmann 1993; Lobao 1990, Chapter 1; Danbom 1995, Chapter 11)

1. Surplus and overproduction
 - a) Fueled by development of agricultural technology and labor-saving devices
 - b) Exacerbated by federal farm subsidies, commodity payments, price supports to largest producers
 - c) Keep crop prices paid to farmers chronically low
 - d) Those farmers not receiving subsidies are placed at an economic disadvantage
 - e) Farmers' status as price-takers and the cost-price squeeze give them little margin for error
 - f) Overproduction has been constant since 1880s (with exception of wartime periods)
 - g) Slim profit margins discourage farmers from adopting conservation farming practices that do not show economic return or that require reinvestment of capital
2. The "cheap food policy": Examples of effects
 - a) Food processing and grain trade industries such as Cargill and ADM are the primary beneficiaries of inexpensive grains. Low grain prices are also good for the grain-fed U.S. meat industry.
 - b) Chronic overproduction keeps some food prices low (for consumers)
 - c) Hurts farmers seeking economic viability
 - d) Important for feeding the population of industrial workers who earn low wages
3. Export agriculture
 - a) Surpluses exported, formed the basis for global food trade
 - i. Major source of revenue and catalyst for U.S. overseas economic development
 - ii. Overseas commodity markets of major strategic importance to U.S.
 - iii. Key component of bi-lateral and multi-lateral Free Trade Associations (FTAs) and the World Trade Organization (WTO)
4. The "production treadmill"
 - a) Increases in overall U.S. production typically result in decreased prices. Farmers have little control over this aggregate production, and must continually increase their own yields just to obtain the same revenue.
 - b) Encourages farming in monocultures and on marginal lands; discourages conservation
 - c) Creates a climate in which early adopters of capital-intensive, yield-increasing technologies are rewarded (e.g., GMO corn, soy), or penalized less
 - d) Those who do not adopt technologies are driven out; leads to familiar pattern of bankruptcy and consolidation

D. Global Food System and Its Relationship With the U.S.

(see Holt-Giménez and Patel 2009, Chapter 3)

Many of the trends happening in the U.S. were implemented worldwide

1. Science and capital together: The green revolution (1960–1990)
 - a) The green revolution aimed to keep countries fed and willing to resist communism. It was a huge effort by a few foundations and Western governments to create hybrid seeds that would be well adapted to local conditions. These seeds "...were dependent on 'packages' of credit, fertilizers, and timely irrigation" (Holt-Giménez and Patel 2009, p. 27). The results of this technology-intensive system were similar to those that occurred in the U.S., in that they system benefited the larger farms, and mostly disenfranchised smaller farms.
 - b) It did not work for poor and women
 - c) It led to more concentration of land ownership
 - d) Farmers forced off the land became part of the urban cheap labor force
 - e) The green revolution "... also produced as many hungry people as it saved." (Holt-Giménez and Patel 2009, p. 24)
2. Structural adjustment programs (SAPs), which started in the 1980s, were instituted by the International Monetary Fund (IMF) and the World Bank when they made loans. Under the premise that "free trade" will lift all boats and work best to help countries "develop," supports to agriculture were cut. This includes price supports, research infrastructure, and trade tariffs to protect the internal agricultural product prices in the South. These SAPs created situations that benefited the corporations dominating agriculture.
3. Free trade agreements (FTAs) and the World Trade Organization (WTO) codified the structural adjustments, and instituted other policies that benefited Northern corporations at the expense of Southern countries
4. Overproduced food in the U.S. and Europe sent as "food aid" overseas often undercut prices of production for local farmers. Similarly, through FTAs and WTO agreements, the U.S. and Europe have continued subsidizing their agriculture, while the Southern countries are not allowed to do this, continuing the undercutting of Southern farmers.
5. Thus, many countries are not able to protect their food system or sovereignty. "... by 2005, 72% of all countries in the global South had become net food importers" (Holt-Giménez and Patel 2009, p 44).
6. Together, these systems create consolidation, drive smaller shareholder farmers from the land, encourage immigration for work, and decrease sovereignty

Discussion Questions, Lecture 1 & 2

DEVELOPMENT OF U.S. AGRICULTURE, LECTURES 1 & 2

- 1) Why do you think it is important to understand or study the development of the food system?
- 2) What did you learn from these 2 lectures that was surprising to you? Why was it surprising?
- 3) What are some of the most concerning aspects of the current, dominate U.S. food system?
- 4) Who do you think most benefits from the current system? How?
- 5) Are there any parts of this history that you are interested in learning more about? Why?
- 6) How does learning about this history impact what you plan to do with the food system in the future (as a farmer, activist, consumer, etc.)?

Lecture 3: The Current U.S. Food & Agriculture System

The U.S. food system as it exists today is the culmination of conditions, events, and actions taken over time. Some of the conditions and actions were described in Lectures 1 and 2. This lecture explores what defines and comprises a food system, and looks at the food system in the U.S. today. Footnotes are used in this lecture due to the large number of references and links, to enable easier access to the source documents.

A. What is a Food System?

(see Goodman et al. 1987; Goodman 1991; Kloppenburg 2004; Heffernan 1998)

The impact of capitalism was another major influence shaping the development of the current agriculture and food system

1. Definitions

- a) A food system encompasses everything involved in feeding people. This includes the production, processing, distribution, consumption, and disposal of food. It also includes inputs (such as soil, water, energy, knowledge, capital, machinery) that go into the various steps of the process. The food system operates within a larger context—which it influences and by which it is influenced. This includes biological, economic, political, and social systems.
- b) “The modern food system has really come together since the Second World War. As The Oxford English Dictionary defines a system, it is a ‘set or assemblage of things connected, associated or interdependent so as to form a complex unity, a whole.’ The food system reflects the prevailing social and economic influences around the world and is a system largely developed, run, and promoted world-wide by economic institutions in the rich and powerful industrial nations.” (Tansey and Worsley, 1995, p. 2)
- c) “. . .the modern world of food is not a random series of ‘facts’ and ‘events’, but a complex and ever-changing web of industrial, technological, economic, social and political factors that shape the journey food takes from its production on the farm to the eventual consumers.” Millstone and Lang 2008, p. 9
- d) Some people talk about the entire food system. Others talk about the multiple systems, such as the local food system, or a community food system. There is no universal or accepted definition of a food system.

2. Aspects of the food system

- a) Appendix 1, Food System Graphics, shows three figures depicting the food system. Figure #2 is the simplest version, and Figure #3 gives the most detail. Additional graphical depictions can be found on-line, and several of these are referenced under Web-based Resources at the end of this unit.
- b) These depictions frequently start with a food chain—generally beginning at the point of food production—then proceeding through processing, distribution, consumption, and then to the waste stream. They also include the context or system that influences, and is influenced by, the food chain. These include social, economic, and environmental factors.

B. Characteristics of the Current U.S. Food System Supply Chain

1. Production

- a) Who is producing the food?
 - i. As in the rest of the food chain, there is significant concentration in production. In 2012 in the U.S., 4% of farms produced 66% of the food (based on value/price of the food).¹
 - ii. In 2012, principal farm operators were primarily white males (83%).² However, there has been growth in the number of minority-operated farms between 2007 and 2012.³ The percentage of women farmers stayed close to the same between the 2007 and 2012 (from 13.9% to 13.7%).⁴
 - iii. The average age of farmers increased from 55.3 in 2002 to 58.3 in 2012.⁵
 - iv. In 2007, there were 2,636,509 hired farm workers on 482,186 farms in the U.S. About a third of these workers spent more than 150 days working on the farm.⁶
- b) What do we produce?
 - i. In 2007, grains and oilseeds made up 79.5% of crop production (in harvested cropland, in acres) and 62.7% of all food production (including animal production). Vegetables and melons comprised 2.5% of crop production (in harvested cropland) and 1.9% of all food production.⁷
 - ii. Corn is the primary crop—making up 44.6% of all the oilseed and grain farming, in harvested cropland. Wheat farming comprised 14.9% of the harvestable cropland for oilseeds and grain.⁸
 - iii. In 2013, the majority of soybean, corn, and cotton crops planted in the U.S. were from genetically modified seeds (to resist pests, intensive herbicide use, or both).⁹
 - iv. Animal production comprised around 50% of total market value for food production in 2007. Cattle ranching and farming made up 59.6% of the animal production, in market value sold, hog and pig made up 11.7% of the market value, and chicken and egg production made up 24.3% of the value.¹⁰
 - v. “Although large concentrated animal feeding operations (CAFOs) make up only 5 percent of all animal feeding operations (AFOs), they contain 50 percent of all animals and produce 65 percent of livestock manure.”¹¹

1 USDA. 2014. Farm Economics: Record high agriculture sales; income and expenses both up. 2012 Census of Agriculture Highlights. www.agcensus.usda.gov/Publications/2012/Online_Resources/Highlights/Highlights_Farm_Economics.pdf

2 USDA. 2014a. Preliminary report: U.S. and state data. 2012 Census of Agriculture. www.agcensus.usda.gov/Publications/2012/Preliminary_Report/Full_Report.pdf

3 USDA. 2014b. Preliminary report highlights: U.S. farms and farmers. 2012 Census of Agriculture. www.agcensus.usda.gov/Publications/2012/Preliminary_Report/Highlights.pdf

4 USDA. 2012. 2012 Census Volume 1, Chapter 1: U.S. National Level Data. Table 56. Women Principal Operators – Selected Farm Characteristics: 2012 and 2007. www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_US/st99_1_056_056.pdf

5 USDA. 2014b.

6 USDA. No Date. Farm Labor. 2007 Census of Agriculture. www.agcensus.usda.gov/Publications/2007/Online_Highlights/Fact_Sheets/Economics/farm_labor.pdf

7 USDA. 2007. Selected characteristics of farms by North American industry classification system: 2007. Table 46. 2007 Census of Agriculture – United States Data. www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_US/st99_1_046_046.pdf

8 USDA 2007, *ibid.*.

9 USDA. 2013. Adoption of genetically engineered crops in the U.S. Economic Research Service. www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us/recent-trends-in-ge-adoption.aspx#UiD7FLzkBQ8

10 USDA 2007, *op. cit.*

11 Gurian-Sherman, Doug. 2008. CAFOs Uncovered: The untold costs of confined animal feeding operations. Cambridge, MA: Union of Concerned Scientists. www.ucsusa.org/assets/documents/food_and_agriculture/cafos-uncovered.pdf, p. 9

2. Processing

- a) According to a USDA Economic Research Report, 8 of the 9 processing industries studied lost 1/3 of their processing plants and let go of 20% of their employees (between 1972 and 1992). These industries include animal processing and packing, corn and flour milling, animal feed production, soybean processing, cheese production, and milk processing.¹²
 - i. See Lecture 2, Concentration and Health, in Unit 3.2, for more examples of current consolidation, and James, Hendrickson, and Howard 2012
 - ii. ADM and Cargill are frequently in the “top 4” in processing, across different industries. Cargill is in the top 4 of beef and turkey slaughtering, beef production (feedlots), animal feed, corn milling, and soybean processing. ADM is in the top 4 of animal feed, as well as corn, flour and soybean processing.
- b) Between 1997 and 2007 the organics industry grew rapidly; during that period, ownership of organic processing companies consolidated.¹³ See the chart of consolidation at: <https://www.msu.edu/~howardp./organicindustry.html>

3. Distribution

- a) The U.S. exports a large proportion of its food—over \$11 billion in value for 2012. However, the U.S. also imports a large amount of food, over \$8 billion worth in the same year.¹⁴
- b) The U.S.’s largest imports in 2012 were cereals and bakery items, followed by fruits. Vegetables were the next largest import, in terms of metric tons. Live animals were the fourth most imported item.¹⁵ In terms of food product value, the most money was spent on fish, shellfish, and fruits.¹⁶

4. Consumption

- a) In a 2013 Gallup poll 47% of respondents said they eat at a fast food restaurant at least once a week¹⁷
- b) According to purchase studies conducted in between 1998–2006, Americans’ food purchases don’t match federal nutrition guidelines. Across incomes, regions, and ethnicities, people were more likely to not eat enough vegetables, whole fruits, legumes, or whole grains. On average, sugar intake was much higher than recommended, as was the consumption of refined grains and frozen and refrigerated entrees.¹⁸
- c) Americans have been found to eat 31% more packaged than fresh food. Additionally, they purchase much more packaged foods than people in other countries.¹⁹

12 Ollinger, Michael, Sang V. Nguyen, Donald Blayney, Bill Chambers, & Ken Nelson. 2005. Structural change in the meat, poultry, dairy, and grain processing industries. USDA, Economic Research Service. Economic Research Report 3. www.ers.usda.gov/media/850597/err3.pdf

13 Howard, Philip H. 2009. Consolidation in the North American Organic Food Processing Sector, 1997 to 2007. *International Journal of Sociology of Agriculture and Food*, vol (16), No (1). Pp. 13-30. www.ijsof.org/archive/16/1/howard.pdf

14 Calculated from “Total value of U.S. agricultural trade and trade balance.” Updated 8/6/13. www.ers.usda.gov/data-products/foreign-agricultural-trade-of-the-united-states-%28fatus%29/latest-us-agricultural-trade-data.aspx#.UijbKrzkBQ8

15 USDA, Economic Research Service. Summary data on food import values for 14 food categories, annual data since 1999. Updated 3/27/14. www.ers.usda.gov/data-products/us-food-imports.aspx#25418

16 USDA, Economic Research Service. Summary data on food import volumes for 14 food categories, annual data since 1999. Updated 3/27/14. www.ers.usda.gov/data-products/us-food-imports.aspx#25418

17 Dugan, Andrew. 2013. Fast food still major part of U.S. diet. Gallup Well-Being. www.gallup.com/poll/163868/fast-food-major-part-diet.aspx

18 Guthrie, Joanne, Biing-Hwan Lin, Abigail Okrent & Richard Volpe. 2013. Americans’ food choices at home and away: How do they compare with recommendations? USDA Economic Research Service. www.ers.usda.gov/amber-waves/2013-february/americans-food-choices-at-home-and-away.aspx#.Uijwf7zkBQ8

19 Fairfield, Hannah. 2010. Factory Food. *New York Times*, Business Section. April 3. 2010. www.nytimes.com/2010/04/04/business/04metrics.html?_r=0

5. Waste

- a) Food is one of the primary materials filling landfills and incinerators. In 2011, 36 million tons of food waste were created, with only 4% of that volume being diverted for composting.²⁰
- b) Forty percent of all food in the U.S. is thrown away²¹
- c) The economic value of wasted food in the U.S. is an estimated \$165 billion each year²²

C. The Supply Chain's Interactions With Larger Systems (see Appendix 1, Food System Graphics)

1. Economic

- a) Loans are critical to farmers, who need to have money up front to buy seeds and other inputs, and in most cases can't earn money from their crop until it is harvested and sold
 - i. Access to capital (money, loans, etc.) is the biggest barrier to entry for new farmers²³
- b) Land rents/costs—access to land is the second biggest barrier for new farmers trying to enter the profession²⁴
- c) Federal Agricultural Subsidies
 - i. The Environmental Working Group 2013 Farm Subsidy Database report on crop insurance states that "... the largest 1 percent of policy holders annually receives about \$227,000 while the bottom 80 percent receives about \$5,000."²⁵
 - ii. Approximately 10% of California's farmers receive direct subsidies. Most of the subsidies go to growers of five crops: cotton, rice, wheat, livestock, corn (but primarily the subsidies go to rice and cotton). Fruit, nut, and vegetable producers (California's specialty crop growers) make up 50% of the state's \$36 billion agricultural economy, and receive close to zero direct support.²⁶

2. Social/Cultural

- a) Access issues: Not everyone has equal access to food—see food deserts discussion in Unit 3.2, Lecture 2
- b) Inequality
 - i. People of color are more likely to live in food deserts, have less access to healthy foods, work in the most difficult and poorly paying food industry jobs, and be affected by environmental hazards due to working in or living near agriculture (see Unit 3.2, Lecture 1)
 - ii. U.S. courts found the USDA responsible for denying African Americans and Native Americans access to agricultural loans, or access to other agency programs (see *Teaching Direct Marketing and Small Farm Viability: Resources for Instructors*, Unit 1)
- c) Research: Academic research is more frequently being supported by the private sector, which provided 25% of funding for land grant agricultural research in 2010. There are concerns that this funding encourages researchers to pursue work that meets private rather than public goals. Examples—universities and percent of research budget from private entities:²⁷

20 US EPA. 2014. Reducing food waste for businesses. Updated on 3/10/2014. www.epa.gov/foodrecovery/

21 Gunders, Dana. 2012. Wasted: How America is losing up to 40 percent of its food from farm to fork to landfill. National Resource Defense Council issue paper. IP:12-06-B, August 2012. www.nrdc.org/food/files/wasted-food-IP.pdf

22 Gunders, Dana. 2012.

23 Shute, Lindsey L., Avery Anderson, Hannah Bernhardt, Tierney Creech, Severine Fleming, Emily Oakley & Benjamin Shute. 2011. Building a future with farmers: Challenges faced by young, American farmers and a national strategy to help them succeed. www.youngfarmers.org/reports/Building_A_Future_With_Farmers.pdf

24 Shute, L.L., et al 2011

25 Environmental Working Group. Crop insurance badly in need of reform. farm.ewg.org

26 Hamerschlag, Kari. No Date. Farm subsidies in California: Skewed priorities and gross inequities. Environmental Working Group. farm.ewg.org/pdf/california-farm.pdf

27 Food and Water Watch. 2012. Public research, private gain: Corporate influence over university agricultural research. documents.foodandwaterwatch.org/doc/PublicResearchPrivateGain.pdf

- i. Iowa State University Entomology: 52% (Syngenta, Bayer)
- ii. University of California Nutrition: 49% (Mars, Novo Nordisk)
- iii. Texas A & M Soil and Crop Sciences: 56% (Monsanto, Cotton Inc., Pioneer Hi-Bred)

3. Political Systems

- a) Different levels of government regulate various aspects of the food system, and can affect efforts to develop a more sustainable food system. For example, federal regulations affect:
 - i. Food safety: There are concerns that regulations such as the Food Safety Modernization Act may favor industrial agriculture and make farming untenable for smaller-scale growers
 - ii. GMO rules: Current rules governing genetically modified crops favor GMO producers over consumers concerned about GMO products; e.g., there is currently no labeling requirement for foods containing genetically modified ingredients
 - iii. Organic certification: The National Organic Program (NOP) regulates and certifies organic producers; many states also have certification and regulation programs. Both often offer “cost share” programs to reduce the economic impact of certification on smaller-scale producers.
- b) The Farm Bill is a multi-faceted federal bill that is revised and reauthorized every 5 years. The Farm Bill has a tremendous impact on the food system by providing (or withholding) funding for programs such as crop insurance and other subsidies via price and income supports; nutrition programs for low-income Americans such as the Supplemental Nutrition Assistance Program (SNAP, also referred to as food stamps) and federally funded school lunch programs; conservation programs such as the Conservation Stewardship Program and Environmental Quality Incentives Program (EQIP); and efforts to support new farmers, such as the Beginning Farmer and Rancher Development Program. (see National Coalition for Sustainable Agriculture, sustainableagriculture.net, for more information.)

4. Environmental/natural resources

- a) Biodiversity
 - i. 91% of the wetlands in California have disappeared ²⁸
 - ii. Overall, U.S. commercial beekeepers have been losing about a third of their hives each winter between 2006 and 2012, which are unprecedented losses ²⁹
 - iii. “The ‘human footprint’ analysis of Sanderson et al. (2002) estimated that 80–90% of lands habitable by humans is affected by some form of productive activity” ³⁰

28 Scherr, Sara J., and Jeffrey A. McNeely. 2008. Biodiversity conservation and agricultural sustainability: Towards a new paradigm of ‘ecoagriculture’ landscapes. *Philosophical Transactions of the Royal Society B*. Vol (363), No. (1491). rspb.royalsocietypublishing.org/content/363/1491/477.full#ref-133

29 Holland, Jennifer S. 2013. The plight of the honeybee: Billions of dollars—and a way of life—ride on saving pollinators. *National Geographic Daily News*. news.nationalgeographic.com/news/2013/13/130510-honeybee-bee-science-european-union-pesticides-colony-collapse-epa-science/

30 Scherr and McNeely. 2008. op. cit..

b) Climate change

- i. Agricultural production of greenhouse gases has generally increased between 2008 and 2012³¹
 - Carbon dioxide (CO₂) from ammonia production (80% of which is for agricultural use/ fertilizer) is up
 - Manure management has only increased output of nitrous oxide (N₂O) slightly, but is putting out much more methane (CH₄), a major greenhouse gas
 - Methane from field burning of agricultural residues has remained approximately the same
 - However, there has been a decrease in CO₂ output from land remaining in cropland

5. Environment/Inputs

- a) Critical fertilizer resources are nearing the peak of easy and accessible production. As demand continues to rise and production decreases, these resources get increasingly expensive, pushing up the price of food.
 - i. Phosphorous is a required ingredient for growing all plant life. It cannot be manufactured. It is found primarily in human and animal waste, but for industrial agriculture it is primarily mined. The U.S. has 25 years of phosphate rock left, and imports much from Morocco (which has close to 85% of the phosphate rock).³²
 - ii. Synthetic nitrogen fertilizer production requires natural gas. Thus, fertilizers are subject to price fluctuations, as are other fossil fuels used in agriculture.³³
- b) Topsoil in the U.S. is disappearing 10 times faster than it can be replaced³⁴
- c) Freshwater resources are decreasing in the U.S., at a time when there are more demands being put on water use, and when, it is predicted, there will be more droughts and changing precipitation patterns due to climate change. In the U.S., agriculture uses approximately 40% of the water from surface and ground water sources for irrigation.³⁵
- d) Seeds: Most of the U.S.'s primary commodities are grown from genetically engineered seeds: 93% of soybeans, 88% of cotton, 86% of corn and 54% of canola.³⁶ See Unit 1.4, Supplement 1, for additional discussion of genetically engineered seeds.

31 US EPA. 2014. Inventory of U.S. greenhouse gas emissions and sinks: 1990-2012. www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2014-Main-Text.pdf

32 Cho, Renee. 2013. Phosphorus: Essential to life – Are we running out? *Phys.org*. 4/2/13. phys.org/news/2013-04-phosphorus-essential-lifeare.html

33 Funderburg, Eddie. 2001. Why are nitrogen prices so high? The Samuel Roberts Nobel Foundation. www.noble.org/Ag/Soils/NitrogenPrices/Index.htm

34 Lang, Susan S. 2006. "Slow, insidious' soil erosion threatens human health and welfare as well as the environment, Cornell study asserts." *Cornell Chronicle*. Cornell University. March 20, 2006. www.news.cornell.edu/stories/2006/03/slow-insidious-soil-erosion-threatens-human-health-and-welfare

35 Megdal, Sharon B., Richard Hamann, Thomas Harter, James. W. Jawitz, and J. Michael Jess. 2009. "Water, people, and the future: Water availability for agriculture in the United States." CAST Issue Paper, No. 44. November 2009. www.cast-science.org/download.cfm?PublicationID=2950&File=f030727a50f063579836506a748341f2f310

36 Freese, B. and G. Kimbrell. 2013. Seed giants vs. U.S. Farmers. Center for Food Safety & Save Our Seeds

Discussion Questions, Lecture 3

DEVELOPMENT OF U.S. AGRICULTURE, LECTURE 3

- 1) Why do you think it is important to understand or study the food system?
- 2) What are other components of a food system, that aren't discussed here?
- 3) What parts of the food system are you most interested in learning more about? Why?
- 4) How many people (or roles they play in the food system), would you guess have been a part of the food you ate this morning? Describe all the roles you think were involved.
- 5) What are some of the most concerning aspects of the current, dominate U.S. food system?
- 6) What might an alternative food system look like? See Nourish website for more discussion questions: www.nourishlife.org/pdf/Food_System_Map_Study_Guide.pdf

References & Resources

SUGGESTED READINGS FOR LECTURES 1 & 2 FOR STUDENTS (DESCRIBED BELOW)

- Buttel, Frederick H. and Howard Newby, eds. 1980
- Clapp, Jennifer. 2012. .
- Cochrane, Willard W. 1993.
- Gardner, Bruce L. 2002.
- Heffernan, William D. 1998.

SUGGESTED READINGS FOR STUDENTS FOR LECTURE 3 (DESCRIBED BELOW)

- Ingredients of the Food System. 2010.
- Millstone, Erick and Tim Lang. 2008.

PRINT REFERENCES & RESOURCES

Berlan, Jean Pierre and Richard C. Lewontin. 1986. The Political Economy of Hybrid Corn. *Monthly Review* 38(3), 35-47.

Buttel, Frederick H. and Howard Newby, eds. 1980. *The Rural Sociology of the Advanced Societies: Critical Perspectives*. Montclair, N.J.: Allanheld Osmun.

A pivotal collection of essays covering a range of social and environmental issues in modern agriculture. This book and its contributors would help to define and direct a new, richly critical sociology of agriculture. Especially Newby and Buttel, "Toward a critical rural sociology;" and Buttel, "Agriculture, environment, and social change: Some emergent issues."

Center for Sustainable Systems. 2012. *U.S. Food System Factsheets*. University of Michigan, Ann Arbor, MI. css.snre.umich.edu/css_doc/CSS01-06.pdf

This fact sheet provides other pieces of information that make up the food system.

Clapp, Jennifer. 2012. *Food*. Cambridge, UK: Polity Press.

This book describes how the current global food system developed, by exploring issues such as corporate influence, skewed trade rules, and financial system changes.

Cochrane, Willard W. 1993. *The Development of American Agriculture: A Historical Analysis*. Minneapolis: University of Minnesota Press.

An excellent critical history of U.S. agricultural development. Full of insightful analysis and commentary as well as exhaustive history. Introduces the concept of the "technology treadmill" as a major problem in U.S. agriculture.

Danbom, David B. 1995. *Born in the Country: A History of Rural America*. Baltimore: Johns Hopkins University Press.

An important history of the effects of agricultural policy and development on rural life and rural people. See especially Chapter 11, "The production revolution and its consequences."

FitzSimmons, Margaret. 1990. The social and environmental relations of US agricultural regions. In *Technological Change and the Rural Environment*. London: Philip Lowe et al. London, David Fuller.

Friedmann, Harriet. 1993. The political economy of food: a global crisis. *New Left Review*: 197.

A succinct history, overview and contextualization of trends in global food trade. Discusses national agriculture and trade policies in the context of international geopolitical relations; and their effects on agricultural development.

Gardner, Bruce L. 2002. *American Agriculture in the Twentieth Century: How It Flourished and What It Cost*. Cambridge, MA: Harvard University Press.

A straightforward, uncritical, but data-intensive and encyclopedic overview of trends in American agricultural development during the 20th century. Full of valuable charts and graphs. An excellent reference.

Goldschmidt, Walter R. 1978. *As You Sow: Three Studies in the Social Consequences of Agribusiness*. Montclair, N.J.: Allanheld Osmun.

A groundbreaking and often-cited study of two agricultural communities in California with different structures of farm ownership. Goldschmidt found that concentration in ownership and corporate control of farms

had negative impacts on such indicators of social welfare as income distribution, civic participation, and quality of education.

Goodman, David, Bernard Sorj, and John Wilkinson. 1987. *From Farming To Biotechnology: A Theory of Agro-Industrial Development*. Oxford, New York: Basil Blackwell.

An integrated theory of the nexus of research, policy, technological development, and capitalist penetration in agricultural development. Considered a seminal work in modern political economy of agriculture.

Goodman, David. 1991. Some recent tendencies in the industrial reorganization of the agro-food system. In *Towards a New Political Economy of Agriculture*. William Friedland, ed.). Boulder, CO: Westview.

A distillation and update of the concepts developed in From Farming to Biotechnology (Goodman et al. 1987); and an overview of the encroachment of industrial capital into the agrofood system.

Heffernan, William D. 1998. Agriculture and monopoly capital. *Monthly Review* 50: 46 (July/August).

An analysis of who controls the agro-food system. A discussion of the historical and modern trends toward oligopoly and monopoly that characterize firms operating in the agro-food sector, and the consequences for the structure and development of agriculture. This topic is Heffernan's specialty.

Heffernan, William D. 2000. Concentration of ownership and control in agriculture. In *Hungry for profit: The agri-business threat to farmers, food, and the environment*. *Monthly Review Press*, pp 61–75.

Hendrickson, Mary, and William Heffernan. 2007. Concentration of agricultural markets. www.foodcircles.missouri.edu/07contable.pdf

Hendrickson, Mary, and William Heffernan. 2002. Concentration of agricultural markets. www.foodcircles.missouri.edu/CRJanuary02.pdf

Hightower, Jim, and Agribusiness Accountability Project. Task Force on the Land Grant College Complex. 1973. *Hard Tomatoes, Hard Times; A Report of the Agribusiness Accountability Project on the Failure of America's Land Grant College Complex*. Cambridge, MA: Schenkman Pub. Co.

A high-profile critique of the research and education agenda of the land-grant university complex in the U.S. Hightower argues that the Land Grant Universities serve and promote large-scale, corporate agriculture at the expense of small-scale, family farmers, and have actively contributed to the decline in family-scale agriculture.

Holt-Giménez, Eric, and Raj Patel. 2009. *Food Rebellions! Crisis and the Hunger for Justice*. Oxford, UK: Pambazuka Press.

This book explores the reasons for the 2008 food crisis, which still continues for many. It looks at both the immediate and underlying causes of hunger in the food system. It provides a concise and clear overview of the issues involved.

Hurt, R. Douglas. 1994. *American Agriculture: A Brief History*. Ames, IA: Iowa State University Press.

A good, but uncritical, survey of American agricultural development with an emphasis on pre-World War II history.

James, Harvey S., Jr., Mary Hendrickson, and Philip H. Howard. 2013. Networks, Power and Dependency in the Agrifood Industry. Pp. 99-126 in *The Ethics and Economics of Agrifood Competition*, Harvey S. James, Jr., ed. New York: Springer.

Kloppenburg, Jack R. 1988. *First the Seed: The Political Economy of Plant Biotechnology, 1492–2000*. Cambridge; New York: Cambridge University Press.

A gripping and well-documented analysis of the “commodification of the seed.” Kloppenburg starts from the thesis that the seed is an important locus of power and autonomy in agriculture, and goes on to show how control over the seed has been transferred from the public domain—farmers and peasants—to a handful of large private corporations; and this transferral's effects on the structure of the agrifood system.

Lobao, Linda M. 1990. *Locality and Inequality: Farm and Industry Structure and Socioeconomic Conditions*. Albany: State University of New York Press.

A Marxian analysis of the structural economic conditions governing agricultural development.

Lyson, Thomas A. 2004. *Civic Agriculture: Reconnecting Farm, Food, and Community*. Medford MA: Tufts University Press.

Mann, Susan A., and Jones M. Dickinson. 1978. Obstacles to the development of a capitalist agriculture. *Journal of Peasant Studies*, Vol. 5, No. 4: 466–481.

McConnell, Grant, and American Farm Bureau Federation. 1969. *The Decline Of Agrarian Democracy*. New York: Atheneum.

A history and analysis of agrarian populist movements in the U.S. Good discussion of farmers' resistance strategies in the face of increasingly powerful corporate control over the food system.

McWilliams, Carey. 1935. *Factories in the Fields: The Story of Migratory Farm Labor in California*. Berkeley, CA: University of California Press.

Excellent and critical historical analysis of farm labor in California. Special emphasis is placed on the ways in which ethnicity and the seasonality of labor demand combine with industrial capitalism's infiltration of agriculture to create an unjust labor system.

Millstone, Erick, and Tim Lang. 2008. *The Atlas of Food: Who Eats What, Where and Why*. Revised and Updated. Berkeley, CA: University of California Press.

This is an excellent summary of the global food system. The book's intention is to describe the global food system, and to provide readers with the background about how this system came to be and where it is likely to go in the future. It explores the current situation, identifying important trends and explores how it may be improved.

National Farm Worker Ministry. No date. Timeline of Agricultural labor in the U.S. nfwm.org/education-center/farm-worker-issues/timeline-of-agricultural-labor/

Patel, Raj. 2007. *Stuffed and Starved*. Brooklyn, NY: Melville House Publishing.

Excellent book that provides an overview of current food system and the results of the choices made by corporations, governments, farming communities and others. Topics covered include farmer suicides, migration, trade agreements and development, agribusiness

winnings, control of the seed, and the example of soybeans – where all the factors described come together. Also includes a focus on the power of the supermarket industry and how people are constrained as consumers.

Pollan, Michael. 2006. *Omnivore's Dilemma: A Natural History of Four Meals*. New York, NY: Penguin Books.

Schafer, Joseph. 1936. *The Social History of American Agriculture*. New York, NY: The Macmillan Company.

A dated but entertaining history of pre-chemical American agriculture, with an emphasis on social organization.

Tansey, Geoff, and Tony Worsley. 1995. *The Food System: A Guide*. London: Earthscan Publications Ltd.

This book's focus is on understanding the food system. It explores what a food system looks like, who are the players and what are the various mechanisms of control.

Wells, Miriam J. 1996. *Strawberry Fields: Politics, Class, and Work in California Agriculture*. Ithaca, NY: Cornell University Press.

Worster, Donald. 1990. Transformations of the Earth: Toward an agroecological perspective in history. *Journal of American History* 76(4): 1087.

A preeminent environmental historian's discussion of agriculture as the fundamental way in which humans relate to, transform, and are themselves transformed by their environments. A call for the reorientation of agriculture towards a more ecologically informed approach.

CALIFORNIA AND COASTAL CALIFORNIA RESOURCES

Daniel, Cletus E. 1981. *Bitter Harvest: A History of California Farmworkers, 1870–1941*. Berkeley, CA: University of California Press.

Jelinek, Lawrence J. 1979. *Harvest Empire: A History of California Agriculture*. San Francisco: Boyd & Fraser.

Lydon, Sandy, and Linda Yamane. 2002. The challenges of interpretation: A conversation. In *A Gathering of Voices: The Native Peoples of the California Central Coast*, Linda Yamame, ed. Santa

Cruz County History Journal #5. Santa Cruz, CA: Museum of Art & History.

This article contains some descriptions of Native American's experiences in agriculture in the Central Coast.

Walker, Richard. 2004. *The Conquest of Bread: 150 Years of Agribusiness in California*. New York: The New Press.

Wise, Timothy. 2011. *Still Waiting for the Farm Boom: Family Farmers Worse Off Despite High Prices*. Global Development and Environment Institute. Boston: Tufts University. www.ase.tufts.edu/gdae/Pubs/rp/PB11-01FarmIncomeMarch2011.pdf

WEB-BASED RESOURCES

Howard, Phil. Information Graphics.

www.msu.edu/~howardp/infographics.html

Excellent information graphics depicting concentration in the food system.

National Sustainable Agriculture Coalition (NSAC)

sustainableagriculture.net

NSAC is an advocacy coalition of grassroots organizations that promotes opportunities for small and medium-scale growers and beginning farmers, encourage sustainable and organic practices, and advocates for expanded on-farm research for sustainable agriculture. Their website is an excellent resource for information on current legislative efforts affecting sustainable agriculture.

CURRICULUM RESOURCES

Center for Ecoliteracy. Nourish Curriculum Guide: What's the Story of Your Food?.

www.nourishlife.org/teach/curriculum/

The nourish curriculum includes a 26-minute movie, and a series of lesson plans/activities for students to participate in. The curriculum is aimed at students from later elementary school through early high school.

Discovering the Food System: An Experiential Learning Program for Young and Inquiring Minds

www.discoverfoodsys.cornell.edu/

This curriculum provides experiential activities to learn about the food system from a hands-

on perspective. By starting "in our backyard," youth learn about how the food system works, who is a part of it, and how they fit within and influence it. It is meant for grades 7 thru 12, but could also work well for college courses.

Gault, Ryan. 2013. *Community and Regional Development (CRD) 20: Food Systems*. Syllabus. UC Davis. Fall 2013.

hcd.ucdavis.edu/faculty/webpages/galt/personal/Galt_Faculty_Page/CRD_20_files/CRD_20-Syllabus.pdf

Gault, Ryan, and Damian Parr. 2013. *Lab Manual Version 3.3 for Food Systems*. UC Davis. Fall 2013.

hcd.ucdavis.edu/faculty/webpages/galt/personal/Galt_Faculty_Page/CRD_20_files/CRD%2020%202013%20Lab%20Manual%20Version%203_3.pdf

Sustainable Agriculture Education Association (SAEA)

sustainableaged.org/ (see "Curriculum Library")

Starting in 2014, SAEA will roll out a place where educators can share syllabi, class exercises, assignments, and information about their degree programs.

Teaching the Food System—A Curriculum

www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system/curriculum/

This is an excellent resource for teaching about a number of food system topics, such as what a food system is, the history of food, agriculture and ecosystems, food processing, food distribution, diet and hunger and food security.

ADDITIONAL FOOD SYSTEM GRAPHICS

- infothread.org/Foods/Global%20Food%20System.jpg
- vodaplan.com/wp-content/uploads/2011/08/SLC-Food-System-1.jpg
- www.vsjf.org/assets/files/tables_figures/execsummary/1-Food%20System%20Diagram.jpg

For pictures of sub-components of the food system, go to:

www.msu.edu/~howardp/infographics.html

VIDEO RESOURCES

The Food System: An Overview

www.tansey.org.uk/news/FStalk.html

This 30-minute video by Geoff Tansey provides a succinct overview of today's food system. The video is divided into five sections, which can be watched individually and discussed by the group, or watched in its entirety. The sections include: the basics, key actors, a changing world, tools for control, and food policy and practice.

What's on Your Plate?

www.youtube.com/watch?v=AQIG710-mdw&feature=youtu.be

This 12-minute illustrated video, commissioned by the University of Vermont, introduces the issues in the dominant food system. It describes the food system in a manner that supports Lecture 3 of this unit, from 3:09 to 7:40.

Appendix 1: Food System Graphics

Graphic #1: The Food System and Its Components

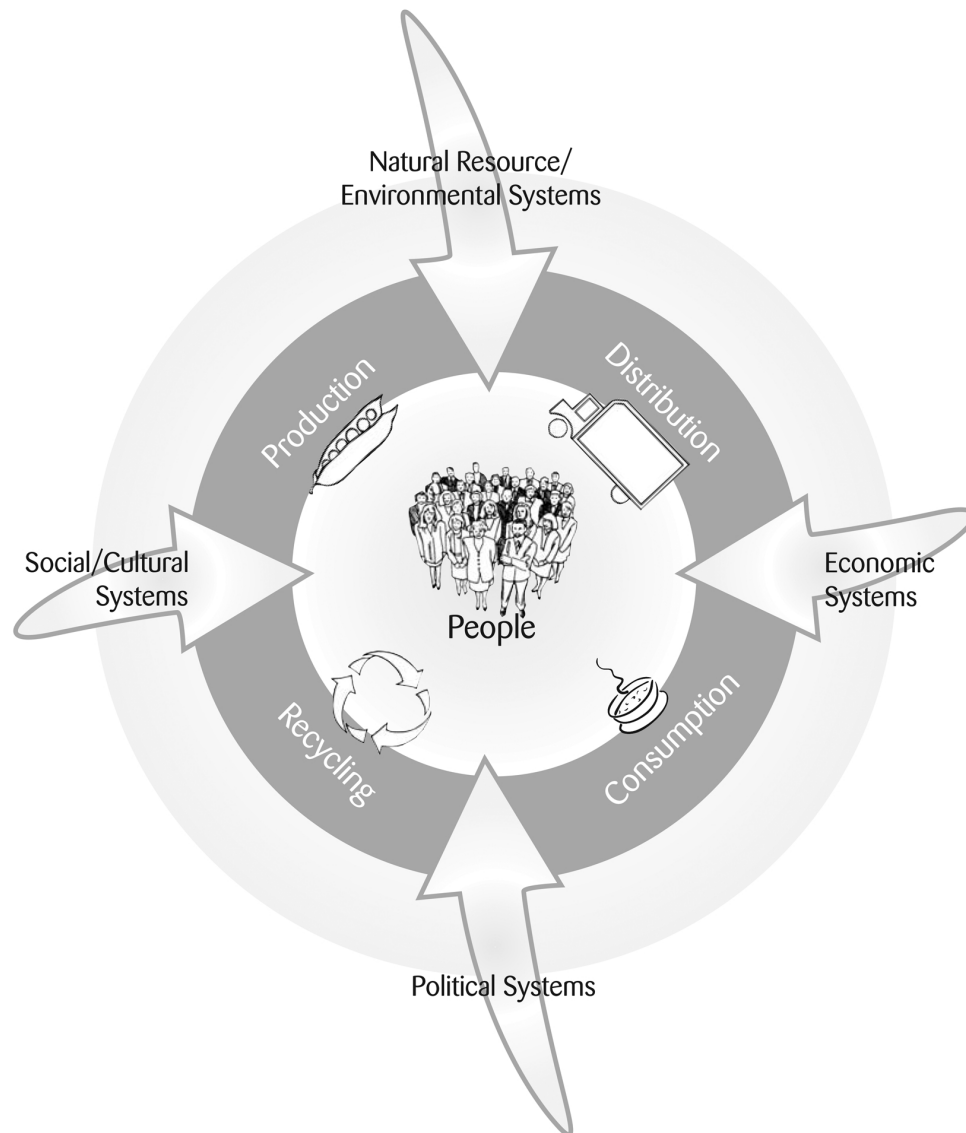
Food System



Developed by the Center for Agroecology & Sustainable Food Systems (CASFS).

Appendix 1 (cont.): Food System Graphics

Graphic #2: The Food System Model



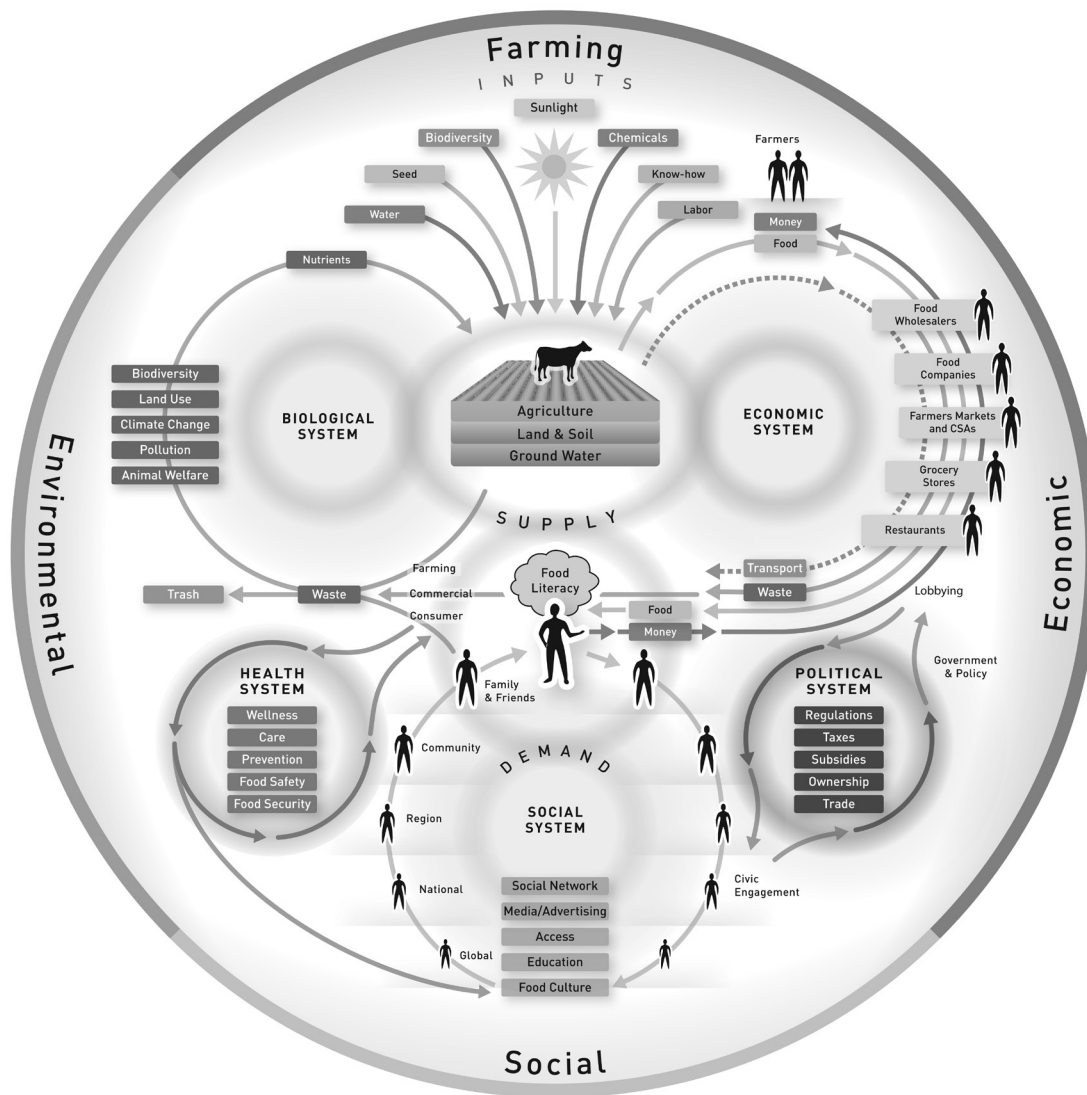
This graphic, developed by the Food Systems Consortium, is published in the 2005 San Francisco Collaborative Food System Assessment. www.sfgov3.org/Modules/ShowDocument.aspx?documentid=780
Used by permission.

Appendix 1 (cont.): Food System Graphics

Graphic #3: Nourish Food System Map

Nourish Food System Map

What's Your Relationship to Food? Look Closer.



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