Food System Policy, Public Health, and Human Rights in the United States

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Abstract

The US food system functions within a complex nexus of social, political, economic, cultural, and ecological factors. Among them are many dynamic pressures such as population growth, urbanization, socioeconomic inequities, climate disruption, and the increasing demand for resource-intensive foods that place immense strains on public health and the environment. This review focuses on the role that policy plays in defining the food system, particularly with regard to agriculture. It further examines the challenges of making the food supply safe, nutritious, and sustainable, while respecting the rights of all people to have access to adequate food and to attain the highest standard of health. We conclude that the present US food system is largely unhealthy, inequitable, environmentally damaging, and insufficiently resilient to endure the impacts of climate change, resource depletion, and population increases, and is therefore unsustainable. Thus, it is imperative that the US embraces policy reforms to transform the food system into one that supports public health and reflects the principles of human rights and agroecology for the benefit of current and future generations.

There is no connection between food and health. People are fed by the food industry, which pays no attention to health, and are healed by the health industry, which pays no attention to food.

—*Wendell Berry* (*14*)

Food system: the inputs, activities, people, outputs, and outcomes associated with getting food from seed to plate

Agroecology: holistic, systems-based approach aimed at integrating qualities of natural ecosystems into agricultural ecosystems in ways that promote sustainable production

US Farm Bill: omnibus bill, usually reauthorized every 5 years, covering agriculture, nutrition, conservation, and other areas related to food and agriculture

INTRODUCTION

The US food system is dynamic, enormous in scope, increasingly complex, and intimately tied to public health and the environment. The system is generally efficient at producing large quantities of food, minimizing human labor requirements, and diminishing the economic costs of production, but it is associated with serious health and ecological impacts. Changing the system requires managing actions in the face of enormous challenges such as population growth, urbanization, climate change, resource depletion, and the vested interests of food and agricultural businesses that benefit from a lack of financial and regulatory responsibility for protecting public health and the environment. Although the current food system in the United States is enabled by policies that perpetuate the status quo and allow externalization of some of the true costs of production, it is also, paradoxically, through policy that many of the most viable avenues of change are available.

What follows is a broad review of US agriculture and food policy, its central role in shaping the food system, and some of the health, social, and environmental problems that are associated with it. In the United States, federal, state, and local policies affect many aspects of the food system. This review focuses primarily on federal policy.

We then offer suggestions to inform actions moving forward, emphasizing the need to change the perspectives and motivations that influence policy formulation. We highlight the principles of a human rights approach that is based on the value that all people have the right to accessible, acceptable, and adequate food that supports an active and healthy lifestyle. In combination with agroecology and public health considerations, such an approach can inform policy for a more just, healthy, and sustainable food system.

AGRICULTURAL MARKETS

US federal policy has a long history of influencing the economics of what and how food is produced. Policy can have important downstream effects—for better and for worse—on agricultural practices, the use of natural resources, the composition of the food supply, food prices, diets, and public health.

The most influential piece of federal legislation in this regard is the US Farm Bill. The bill's precursor, the Agricultural Adjustment Act (AAA) of 1933 (169), was passed in response to agricultural surpluses—and the associated drop in prices that farmers received for their goods—during the Great Depression. The AAA was the first widespread effort by the US federal government to influence agricultural markets. It aimed to stabilize prices by implementing several measures to balance production with demand, such as by incentivizing farmers to reduce their crop acreage, and curtailing food animal production. Subsequent legislation, including amendments to and later versions of the AAA, introduced soil conservation programs (in response to lessons learned from the Dust Bowl, when aggressive tillage across the American midwest, combined with a period of prolonged drought, led to severe soil erosion and dust storms), federally subsidized crop insurance, marketing loans, strategic grain reserves, and other means of maintaining stable farm incomes through unpredictable times (127, 135).

Federal involvement in price stabilization and production controls ended with the Federal Agricultural Improvement and Reform (FAIR) Act of 1996, commonly known as the Freedom to Farm Act. FAIR also established direct payments to commodity farmers (44, 86), which ended

with the 2014 reauthorization of the Farm Bill. Many have criticized these direct payments on the assumption that they contribute to obesity by lowering costs of inputs to processed foods. Repeated analyses, however, suggest that direct payments have negligible effects on the retail prices of nutrient-poor foods and beverages, dietary behaviors, or obesity (2, 3, 13, 44, 104, 116, 128). Indirect effects of subsidies, however, have a larger influence in that they support a system that favors the growth of commodities over production of fruit and vegetables. Payments and support to farmers as well as increased research and infrastructure related to commodity crops have stacked the deck in favor of their production, leading to increased production of cheap oils and grains as well as meat and processed foods that depend on these inputs (45, 126).

Vertically integrated: having multiple supply-chain stages for the same product (e.g., hog breeding, production, slaughter) owned by the same company

Many other US agricultural policies have been counterproductive for the public's health in other ways. The consequences of these policies have included pressures for farms to "get big or get out" (198), the promotion of industrial agriculture by land-grant colleges (43), the creation of an unequal playing field for organic producers and growers of fruits and vegetables (80), the dismantling of programs that curb overproduction (44), and the use of only weak incentives to adopt more sustainable methods. Such policies have greatly contributed to an agricultural system that is characterized by large-scale mechanized monoculture, heavy reliance on chemical inputs, and a market flooded with low-priced grain.

The deregulation of agricultural markets under FAIR had additional repercussions for US farmers. As a result of increasing levels of market concentration among a small number of powerful corporate entities—such as those in the poultry, swine, and processing industries—many farmers, no longer protected by federal price supports, faced greater economic pressures to accept the conditions set by vertically integrated corporations and large processing firms (86). Also, weak enforcement of US antitrust laws has allowed the continued concentration and consolidation of markets in food system industries (65, 196), often at the expense of farmers' autonomy over how food is produced (66).

US agricultural policies have also had far-reaching effects on international markets. The US government distributes surplus commodities internationally via the World Food Program and the US Agency for International Development. This strategy serves to support market prices in the US and alleviate immediate hunger in areas where the surplus food is distributed, but it may interfere with markets in recipient countries in ways that adversely affect local producers (143, 160), although the severity of this effect has been debated (7). The 2014 reauthorization of the Farm Bill aimed to reduce the potential adverse effects of commodity donations on foreign markets by expanding the amount of funds that could be used to purchase crops from farmers in recipient countries (140).

RESOURCE CONSERVATION, ECOSYSTEMS, AND ENVIRONMENTAL HEALTH

The whole problem of health in soil, plant, animal and man is one great subject.

—Sir Albert Howard (68)

Following World War II, the industrialization of agriculture played an important part in what was an extended period of material prosperity and unprecedented levels of food production in the US (35). The industrial model of food production successfully generates enormous caloric output relative to its requirements for human labor (175), and has been described as "the most efficient. . .in the world, at least in terms of the dollar and cent costs of production" (70). These results, however, have been associated with dramatic increases in the use of pesticides, chemical

fertilizers, and other external inputs (92). Taken together with industrial agriculture's emphasis on specialization, mechanization, and consolidation, the reliance on off-farm inputs imposes heavy costs on farm workers, rural communities, the population as a whole, and the ecosystems upon which humans rely. Industrial food animal production (IFAP) is particularly damaging in these regards, both directly and via indirect harms that result from feed-crop production. Although the full spectrum of these concerns is beyond the scope of this review, some of the key challenges pertaining to resource conservation, ecosystems, and environmental health include those described below:

Consolidation: shift toward fewer and larger operations (e.g., farms) in an industry

Industrial food animal production (IFAP): model characterized in part by specialized operations, standardization, high densities of livestock, large quantities of waste, and heavy reliance on external inputs

- **Soil degradation**: The continued degradation of agricultural land is driven in large part by the scale and practices of industrial agriculture, which impair the essential ecosystem services associated with soil (e.g., water and nutrient retention) and undermine farmers' long-term capacity to produce food (121).
- **Freshwater depletion**: An estimated 80–90% of US consumptive water use (137) is attributable to agriculture. In particular, food animal production (especially feedlot beef production) demands indirect freshwater inputs via the production of feed crops (67, 100). In parts of the Great Plains, groundwater sources have been depleted by as much as 30%, largely for corn production (152).
- **Water degradation**: Agricultural activities are leading contributors to water pollution (186). IFAP operations, for example, may introduce nitrates, microbial pathogens, veterinary pharmaceuticals, hormones, and other contaminants into groundwater and surface water—often via the application of animal waste—thus contributing to a range of adverse health and ecological effects (19).
- **Air degradation**: IFAP operations are frequently associated with elevated indoor and downwind concentrations of airborne pollutants, including ammonia, hydrogen sulfide, and airborne particulates, which contribute to respiratory illnesses and other adverse health effects among workers, their families, and nearby residents (64, 101, 105, 138). Similarly, pesticide applications may present health risks to agricultural workers (20) and nearby residents (93, 146).
- **Biodiversity loss**: Roughly half of US cropland is used for genetically uniform monocultures of corn and soybeans (40, 185); for example, Monsanto's Roundup Ready® seeds accounted for 93–94% of US soybean production in 2012 (16). Biodiversity loss among domesticated species used in agriculture, and in the general ecosystem, impairs agriculture's resilience and adaptability to climate change and other shocks (159).
- **Fossil resource depletion**: IFAP depends heavily on declining fossil resources for irrigation systems, farm machinery, animal housing, transportation, and chemical manufacturing (113). Global oil reserves are estimated to be near or beyond what is known as peak oil, the point at which extraction rates begin to decline (49, 113). It has been estimated that phosphate rock sources, mined for fertilizers, will be depleted in 50–100 years (28). In light of these concerns, the long-term viability of agriculture and other food system sectors depends upon a shift toward renewable alternatives.
- **Climate change**: Food system activities, from production through the decomposition of food waste in landfills, are major sources of greenhouse gas (GHG) emissions. Research demonstrates that diets high in refined sugars, refined fats, oils and meats not only are unhealthy, but play a major role in greenhouse gas emissions and global land clearing (158). The production of red meat and dairy products together account for an estimated 48% of GHG emissions associated with US food supply chains (191). Climate change is expected to intensify many of the aforementioned challenges, impairing agricultural productivity in many of the most food insecure regions of the world (56, 114, 139).

US agricultural policies address these concerns to varying degrees, and in some cases perpetuate them. The US Farm Bill supports several programs aimed at incentivizing farmers to reduce their use of energy and freshwater; reduce or sequester GHG emissions; support biodiverse ecosystems; and improve or protect the quality of air, water, and soil. These programs operate in part by paying farmers to take environmentally sensitive lands out of production (178), providing them with technical and financial assistance (181), and requiring them to comply with land conservation measures in order to be eligible for federally subsidized crop insurance (95). Measures were added to the 2014 Farm Bill to support more diverse and sustainable forms of production: it increased funding for research on fruit, vegetable, and organic crops; allowed fruit and vegetable growers to receive federally subsidized crop insurance (they were previously ineligible); and increased insurance payouts for organic producers to match the higher market values of their products (95). Despite these changes, US agricultural policies generally continue to provide greater support for monoculture production systems than for biodiverse systems.

Other federal policies, such as the Clean Air Act of 1970 and the Clean Water Act of 1972, authorize the US Environmental Protection Agency (EPA) to regulate certain agricultural pollutants. For example, the concentrated animal feeding operation (CAFO) rules implemented under the Clean Water Act require certain IFAP operations to adopt measures to reduce nutrient pollution, such as by controlling manure runoff (27). The effectiveness of the CAFO rules, however, has been severely constrained by a lack of authority to mandate compliance (24), the limited capacity of the EPA to oversee state programs (57), and exemptions made for runoff during storms (when much of the pollution occurs) (194). Furthermore, as a result of industry pressure to weaken the scope of CAFO rules, they apply only to the largest operations, and do not regulate heavy metals, pathogens, antibiotics, or contaminants other than nutrients (57). Air pollutants and odors from agricultural activities, with a few exceptions, remain exempt from federal (Clean Air Act) and state air-quality standards (194).

In addition to federal and state policies, and regulations addressing IFAP operations, some local jurisdictions have used regulations to prevent new operations from being located in their communities or to mitigate the environmental impacts of existing facilities (63). These include zoning laws, nuisance laws, setback regulations, and restrictions on sprayfields for animal waste disposal, as well as requirements for additional permits and reporting to local agencies (63). However, some of these attempts have been blocked by preemption, limiting the ability of local jurisdictions to act when federal or state laws override their regulation (63, 133).

With respect to problems of fossil fuel dependency and climate change, US federal policy intended to promote crop-based biofuels has been misguided. The Renewable Fuel Standard (RFS), created under the Energy Policy Act of 2005, requires that a percentage of fuel in gasoline comes from renewable sources, resulting in ethanol production accounting for 42% of US corn used during 2012–2013 (177). Without RFS subsidies, the industry would not be financially sound, as the energy returned on energy invested is low, with extensive impact on the environment (150). Until more sustainable and energy-efficient cellulosic alternatives to corn ethanol become viable—perennial grasses hold promise (150)—the RFS is of questionable value.

Concentrated animal feeding operation (CAFO): EPA designation for operations that meet certain regulatory criteria for animal confinement, size thresholds (e.g., 10,000 swine), and waste handling

Nutrient pollution: releases of excess nutrients (e.g., phosphorous) into groundwater or surface water; the latter contributes to algal growth and hypoxic (low-oxygen) conditions

Setback regulations: requirements that structures (e.g., livestock operations) be sited at defined distances from roads, streams, and properties

Sprayfields: crop or pasture fields fertilized with liquid or solid manure, a common method of disposing of waste from animal feeding operations

Preemption: invalidation of state or local law when a federal or state law contradicts it

ANTIMICROBIAL RESISTANCE

Low doses of antibiotic drugs have been found to promote growth in healthy poultry, swine, and cattle (61), prompting their widespread use in food animal production (46). This practice selects for antibiotic-resistant bacterial strains (145), which may spread through human populations via workers (53, 125, 129, 149), environmental media (21, 22, 25, 52, 136, 141), flies (58), animal transport vehicles (132), animal products (36, 62), and other pathways. Resistant infections in

humans are more difficult and expensive to treat (131) and more often fatal (41) than infections with nonresistant strains. The continued misuse of antibiotics in food animal production thereby threatens the effectiveness of these lifesaving resources for combating disease.

In response to these concerns, the European Union enacted legislation to phase out the use of growth-promoting antimicrobials (118). In contrast, the US Food and Drug Administration's (FDA's) regulation of antimicrobial use in food animal production has largely been limited to a ban on cephalosporins (2012) and the issuing of voluntary guidelines requesting drug companies to withdraw approvals for the use of antimicrobials for growth promotion (2012) (73). Despite these guidelines, the FDA continues to endorse the use of antimicrobials for disease prevention, which allows for dosing that is largely indistinguishable from growth promotion (73), thus tolerating business as usual. Efforts to monitor and address antimicrobial resistance have been hampered by a lack of publically available data from the industry; despite a law requiring the release of such information, the FDA has withheld all but the most general information in annual reports (73).

OCCUPATIONAL SAFETY

Food system workers often face health, social, economic, and cultural barriers that interfere with their ability to assert their right to a safe workplace—a right recognized by the US Occupational Safety and Health Administration (OSHA) (184). Data suggest that the majority of US food system workers (from those working on farms to those working in retail) lack health care coverage and paid sick days; many do not receive proper safety training or equipment; and only 13.5% receive a living wage (42). In US crop production, workers experience elevated risks of fatal injury (183) and exposure to pesticides (20). IFAP workers may come into frequent contact with animal waste, carcasses, and other sources of microbial pathogens, and face particular risks from antibiotic-resistant infections (118). Although injury rates among workers in the meat processing industry have greatly declined, they remain 45% higher than the US average (183), and their risks of antibiotic-resistant infections are heightened by the potential to incur cuts, scrapes, or burns on rapidly moving lines (82, 108). Proposed revisions to the US Department of Agriculture's (USDA's) rules for line speeds and inspections of poultry slaughter and processing facilities would have heightened these risks—as well as risks of cross-contamination—by increasing allowable line speeds; the limit of 140 birds/minute for chicken was held constant due to negative public response (171). Food system workers frequently lack agency to advocate for safer conditions; migrant agricultural workers, many of whom are undocumented, are often the most vulnerable in this regard, and may face language barriers, threats of deportation, and other deterrents (188, 190).

Many of these harms are perpetuated by a lack of federal oversight. Agricultural industries, in particular, have a long history of exemption from US labor policies such as child labor laws. Protection for farmworkers under OSHA is limited to requirements for drinking water, facilities for hand washing, and bathrooms in farm fields, among a few other minimal workplace standards; and agricultural operations with fewer than 11 employees—not uncommon for a highly mechanized industry—remain exempt from OSHA enforcement (90).

MICROBIAL AND CHEMICAL CONTAMINATION

The US food supply, although relatively safe in most regards, is vulnerable to contamination by pathogens, microbial toxins, heavy metals, pesticides, pharmaceuticals, and a range of other microbial and chemical agents. In addition to the morbidity and mortality associated with chronic

low-dose exposures, there are an estimated 48 million cases of foodborne illness annually in the United States, resulting in 128,000 hospitalizations and 3,000 deaths (23).

US federal policies operate along various points of the food supply chain to address contamination risks. For example, the hazard analysis and critical control point (HACCP) process is a prevention-based approach mandated by the USDA (for meat) and the FDA (for juice and seafood) that identifies and monitors food safety hazards at key points along the supply chain (71, 76, 81). Although HACCP programs may aid in reducing foodborne contamination (192), they are not fail-safe, and industry participation is voluntary for products other than meat, juice, and seafood (156). The Food Safety Modernization Act, signed into law in 2011, is slated to provide the FDA with greater authority to oversee domestic and imported foods (47, 157). However, implementation has been delayed, in part due to budgetary limitations (144).

In addition to the aforementioned policy gaps, many other concerns associated with microbial or chemical contamination of the food supply remain largely unaddressed by federal or state legislation. Many of these concerns stem from practices common to IFAP, such as the continued use of arsenical drugs in poultry production (110), the use of hormones in beef and dairy production, and the widespread administration of antimicrobials (see the section entitled Antimicrobial Resistance). Animal slaughtering and meat-processing facilities present further multiple opportunities for microbial cross-contamination (77, 119), which are heightened by the volume of carcasses and the speed at which they are processed.

DIET-RELATED DISEASE

The food system affects our health directly and indirectly by the quantity, quality, and safety of the food we eat. US dietary patterns have shifted dramatically during the past several decades, with substantial increases in the consumption of soft drinks (173), snack foods (123), high-fat dairy (176), added sugars (176), and other energy-dense, nutrient-poor foods and beverages. US per capita intake of animal products, meanwhile, is among the highest in the world—over thrice the global average (164). Although evidence exists to define healthy diets (38, 193), which is partially reflected in federal nutrition guidelines, the average American does not eat enough nutrient-dense and health-promoting foods, such as vegetables, fruits, whole grains, and healthy fats (182).

The prevalence of obesity and diet-related chronic disease has also increased sharply (122). US obesity rates have more than doubled since the 1970s, with more than two-thirds of adults and one-quarter of children currently classified as overweight or obese (115). Diet-related chronic diseases are among the leading causes of premature morbidity and mortality in the United States and account for the majority of costs associated with health care and lost productivity (130). Chronic conditions such as cardiovascular disease, type 2 diabetes, metabolic syndrome, and certain types of cancers have been associated with elevated intake of red meat and processed meat (29, 79, 85, 102, 103, 117, 142, 147), added sugars (11, 75, 96, 98, 197), saturated fats and trans fats (69, 83, 107, 134, 148), and energy-dense foods in general (187). Of particular concern, poor diet contributes to the disproportionate burden of obesity, malnutrition, and diet-related diseases in low-income and minority populations in both urban and rural areas (112).

Environmental influences play a large role in determining dietary choices. Factors such as marketing and product formulation (106, 155), and larger portion sizes (120, 155), as well as the ready availability of energy-dense convenience and snack foods (8, 120, 155), make consuming excess calories from unhealthy foods difficult to avoid.

Several local and state governments, often with support from food policy councils, have created or attempted to create policies to encourage healthier eating. The ban on trans fats in numerous locales is a great public health success story (37, 168). The trade-off between the right to choose

an unhealthy diet and the public health imperative to encourage communities to adopt healthy diets is illustrated by the unsuccessful attempt by the New York City health department to reduce sugar intake by banning large sodas (59, 60).

Disagreements over policy in the US Congress led to the different approaches used for Supplemental Nutrition Assistance Program (SNAP) benefits, which can be used to obtain unhealthy foods, and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) program, which restricts choices to healthier foods (9, 10, 72, 111, 179). Other policies, such as the Healthy Food Financing Initiative, aim to increase access to healthier foods by bringing supermarkets into low-income areas (51, 161). Other programs include incentives for purchasing them; for example, some programs offer added value when SNAP benefits are used to purchase fruits and vegetables at farmers' markets, while Farmers' Market Nutrition Programs provide seniors and WIC participants with coupons that can be used at farmers' markets (170, 172). Other incentives include funding farm-to-school or farm-to-business programs to create healthier meals, supporting education about gardening and food preparation in schools, and providing federal grants to improve local and regional food sheds.

Supplemental Nutrition Assistance Program (SNAP): a USDA program that provides low-income populations with assistance in purchasing food (previously known as the Food Stamp program)

Special Supplemental Nutrition Program for Women, Infants, and Children (WIC): USDA program that funds supplemental food, health care referrals, and nutrition counseling for pregnant, postpartum, and breastfeeding women, and nutritionally at-risk children

International Bill of Human Rights: consists of the Universal Declaration of Human Rights, the International Covenant on Civil and Political Rights, and the International Covenant on Economic, Social and Cultural Rights

Respect: obligation of a country through its laws and state entities to honor the rights of its population

Protect: obligation of a country to prevent nonstate entities from violating the rights of its population

RIGHTS TO FOOD AND HEALTH

> *The human right to adequate food is recognized in several instruments under international law. The International Covenant on Economic, Social and Cultural Rights deals more comprehensively than any other instrument with this right. . . . States parties recognize "the right of everyone to an adequate standard of living for himself and his family, including adequate food, clothing and housing, and to the continuous improvement of living conditions" . . . [and] recognize that more immediate and urgent steps may be needed to ensure "the fundamental right to freedom from hunger and malnutrition". The human right to adequate food is of crucial importance for the enjoyment of all rights.*
>
> —*General Comment No. 12: The Right to Adequate Food* (162)

Following the devastation of World War II, the modern human rights legal system was formed, with its core framework outlined in the International Bill of Human Rights. The associated treaty obligations require members of the United Nations (UN) to respect, protect, and fulfill a broad array of civil, political, social, economic, and cultural rights for their citizens. Articles 11 and 12 of the International Covenant on Economic, Social and Cultural Rights proclaim the right to adequate food and the right to the highest attainable standard of health. In 1999, the UN Economic and Social Council interpreted Article 11 to mean that all people should have access to sufficient quantities of safe, healthy, nutritious, affordable, and culturally appropriate food at all times (162). In 2000, the council interpreted Article 12 to define the broad array of determinants of health necessary to fulfill the right to health, including food, water, housing, a livelihood, as well as protection of the environment, safe places to work, and high-quality clinical and public health services (163).

Recognizing the essential relationship between the right to food and the right to health can help inform agricultural policy. The central tenet of both the right to food and the right to health is the commitment to their availability, accessibility, and acceptability, as illustrated in **Figure 1**. These three parts of the commitment, along with the concepts of adequacy with respect to the right to food and quality with respect to the right to health, establish standards for judging whether these fundamental rights are being fulfilled. It is essential that national governments develop systems that are able to fulfill these rights for any given individual without impinging upon the rights of others or the rights of future generations. Sustainability, therefore, is another concept that is central to any rights-based approach to the food system.

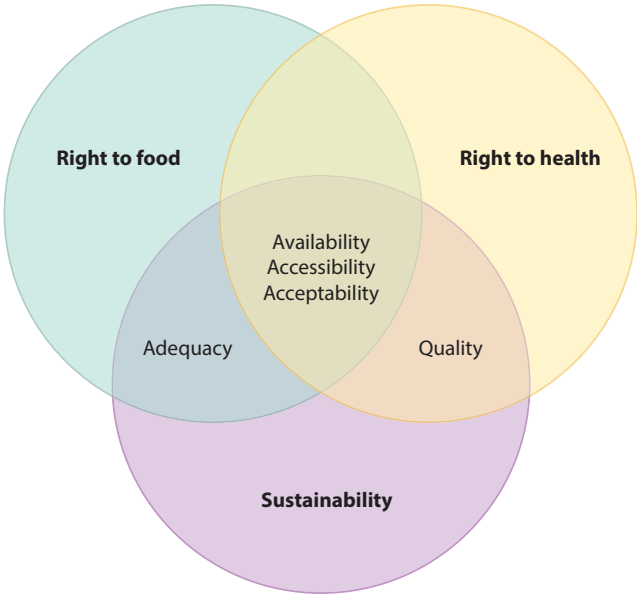

Figure 1

Agriculture and public health: the right to food and the right to health.

Availability

The concept of availability focuses on whether there is sufficient food to consistently meet the energy and nutrient requirements of the population. Farmers must be able to generate sufficient quantities of food for it to be available. In fact, in terms of caloric output, the world's farmers could currently feed 122% of the global population (165) were it not for logistical, political, allocative, and economic barriers to an adequate distribution system. However, in order to continue to make food available for growing populations policies must support more ecological models of production that incorporate practices designed to conserve the vital resources that are currently being degraded or depleted (99).

Accessibility

Accessibility refers to the ability of each person or group of people to obtain food, and it requires the equitable distribution of food at a societal or global level. In simple terms, access means having sufficient resources and ability to obtain appropriate foods for a nutritious diet without sacrificing other basic necessities. In human rights law, accessibility has four components: physical, economic, informational and nondiscriminatory.

Physical accessibility. Physical accessibility refers to the ability to obtain food in a particular geographical area. Even with great increases in food production in the United States and globally, poor distribution denies many people access to healthy food in the food deserts of rural and urban America, despite policies such as providing funding for SNAP and WIC. Policies that encouraged the shift from diverse agriculture to specialized monocropping for commodity production have left many farmers unable to grow food for their own families and communities. Low-income neighborhoods often have no grocery stores to provide fresh fruits and vegetables, only corner

Fulfill: obligation of a country to take progressive measures to move towards creating a state where all rights can be met for the entire population

UN Economic and Social Council: committee charged with monitoring adherence to the International Covenant on Economic, Social and Cultural Rights

stores and bodegas that sell mainly highly processed foods that have an extended shelf life (54, 55, 189).

Economic accessibility. Economic accessibility refers to the ability of people to afford to buy or grow the food they need. Although the average American household spent only 11.4% of disposable income on food in 2013 (174), low-income households often have to choose among competing needs before purchasing food, thus leading to 47 million people receiving SNAP benefits in an average month in 2012 (84). The intense political debate about SNAP during discussions about the 2014 Farm Bill, which resulted in an $8.6 billion cut to the program over 10 years (94), reflects the deep divide between those who believe that access to food is a right that the state should guarantee and those who disagree and emphasize individual responsibility instead.

Accessibility of information. Accessibility of information relates to all levels of the food system, from farm to fork. The term refers to the awareness of food policies; the components of a nutritious diet; the ingredients in particular foods; and the methods by which food is farmed, produced, and prepared for consumption.

Based on the most recent publically available data, in 1997 US food manufacturers spent more than $7 billion marketing food and beverages, predominantly to promote sales of snacks, soft drinks, and other nutrient-poor products (50). In 2009, food marketing to youth was similarly skewed in favor of nutrient-poor foods (e.g., carbonated beverages and breakfast cereals) (88). By comparison, the budget available to the public health community for health communications and the social marketing of healthy diets is extremely small, which greatly distorts the accessibility of information (15, 48, 151). Children may be particularly susceptible to the effects of food advertising (153), and most children younger than 8 years of age are developmentally unable to recognize that the intent of advertising is to influence purchasing behaviors (26). Staff at the US Federal Trade Commission (FTC) stated in 1981 that it was unfair and deceptive to advertise to children younger than 6 years (39), but a proposal to restrict the advertising of high-sugar foods to children was met with strong opposition and a rebuke from Congress that weakened the FTC's regulatory authority (12).

Due to protection of proprietary information, and contract stipulations with vertically integrated agribusinesses, farmers often do not know the specific ingredients of what they feed their animals and, in turn, the general public may be similarly uninformed about potential chemical and microbial contaminants in the animal products they consume. Concerns about the lack of transparency in labeling and the possible consequences of foods containing genetically modified organisms (GMOs) led Vermont to pass the first statewide food labeling law in 2014 (74, 154).

As large industrialized and specialized farms focus on single commodities (e.g., corn, soybeans, swine, dairy, poultry) and dominate US agriculture, the diverse family farm of 150 to 200 acres has largely disappeared, and along with it, much of the knowledge of traditional practices required for rotational cropping, integrating animals into the crop-production rotation, raising animals in pastures, and using traditional seeds. Although about 2,900 USDA Cooperative Extension System offices throughout the country provide advice and technical support to agricultural communities, they generally emphasize commodity production agriculture (180).

Nondiscrimination. Nondiscrimination refers to the condition in which everyone is assured physical, economic, and informational accessibility without regard to their ethnicity, race, religion, class, sex, or other attributes that can exacerbate food insecurity for marginalized populations (112). Violations of environmental justice are common in low-income communities and in communities of color where IFAP facilities are frequently located (195).

Acceptability

Acceptability refers to the ability to obtain food that satisfies the social and cultural values of a particular population. Developments in food science have been applied to enhance the appeal and palatability of processed foods, especially those manufactured from the commodity crops supported by the Farm Bill (78). The marketing of these products plays a key part in acculturating the population to a diet that is inherently unhealthy and unsustainable. The concept of acceptability in this context is complex. If foods that many people now desire are unhealthy and unsustainable, then the right to food adequacy is being denied at the same time that acceptability appears to be upheld. Policy development in this area should be informed by a public health perspective, which can invoke the interdependence of the rights to food, health, and education to justify efforts to change cultural acceptability through health education and by advocating for policy changes to improve diets and the food supply (166, 167).

Interdependence: principle denying any hierarchy of rights despite separate conventions for civil and political, and social, economic, and cultural rights

Health Quality and Food Adequacy

In two recent statements the UN Economic and Social Council clarified the relationship between food adequacy and health (162, 163). Without food adequacy, the right to health cannot be fulfilled, and without attention to other key determinants of health—the protection of the environment, safety in the workplace, and progress in other social determinants of health—there will not be a healthy agricultural workforce to fulfill the right to food.

In the United States new policies are needed to fulfill the right to food and the right to health. Clinical care dominates the health system, with inadequate attention paid to primary and secondary prevention, especially in the area of nutrition. The industrialized food system has created what Brownell (18) describes as a "toxic" and "obesogenic environment," in which many find the struggle to adopt and maintain healthier diets simply overwhelming. The Affordable Care Act of 2010, through its provision for Accountable Care Organizations and emphasis on prevention, provides a new policy framework for improving diet and nutrition.

Sustainability

A sustainable food system is one that provides available, accessible, acceptable, and adequate food without impinging on the rights of future generations to have the same. This means adopting an ecological agricultural system that is self-renewing through the proper stewardship of soil, water, and plant varieties, and the use of practices such as rotational cropping, integrated pest management, low-till or no-till planting, and careful management of the farm-to-fork value chain to reduce waste—all of which are potential areas through which policy reform could be enacted during the reauthorization of the Farm Bill if adequate funds were appropriated. Sustainability also means adopting diets that are less dependent on foods that require high inputs, such as the 7 kg of feed required for each kilogram of beef produced (17). An ecological agriculture system maintains seeds, cuttings, animal strains, and soil fitness for those foods that are adapted to local environments. At a food system level, this means supporting policies that enable rural farming communities to prosper, and poorer communities in cities to have access to markets providing healthy nutritious food, some of which may be produced by urban and periurban agriculture.

Given the close relationship between income levels, health status, and food security, it is noteworthy that in low- and middle-income countries, investment in small-scale agriculture produces greater gains in household income than any other form of investment (33). Supporting and empowering women farmers, who represent the majority of agricultural workers worldwide, has additional positive effects on household income, education levels, and health (1, 32). Policies to

support subsistence farmers include microcredit and other rural credit schemes that have lending policies favorable to them. Farmers who are not burdened by high debt are often able to have longer-term vision and work to create more sustainable uses for their land. Emphasizing services and infrastructure in rural areas that support technologies appropriate for small-scale agriculture would also help alleviate rural poverty in the United States and overseas.

POLICY RECOMMENDATIONS TO SUPPORT A JUST AND SUSTAINABLE FOOD SYSTEM

> *The combined effects of climate change, energy scarcity, and water paucity require that we radically rethink our agricultural systems.*
>
> *—Olivier De Schutter, UN Special Rapporteur on the Right to Food, 2008–2014 (34)*

The problems associated with our food system are perpetuated to a considerable degree by food and agricultural policies that directly or indirectly support the prevailing industrial model of food production, processing, and marketing, all of which encourage the overconsumption of nutrient-poor foods and help facilitate the ongoing concentration of food and agricultural markets. Such policies (and in some cases, the absence of policies) allow entrenched patterns of power, norms, and behaviors to persist while offering inadequate support for viable alternatives, often at the expense of the public's health, farmers' economic independence, and the long-term capacity to sustain productive and biodiverse agricultural systems.

No single policy strategy or series of tactics can address all of the problems associated with industrial methods of food production or the food system overall. Nor do the many determinants of food insecurity and poor dietary choice lend themselves to simple policy solutions. Since the full spectrum of potential interventions is beyond the scope of this paper, an illustrative set of policy recommendations is provided in **Table 1**.

Beyond specific policy recommendations, we believe that an approach to policy development that combines the principles of human rights and the values of public health with an agroecological perspective can inform policies that respect both the planetary and social boundaries of a just food system (**Figure 2**).

Thus, agroecology is central to addressing the foregoing problems. It is a holistic systems-based approach, aimed at integrating the qualities of natural ecosystems into agricultural ecosystems in ways that promote sustainable production (4, 97). Specifically, it focuses on supporting natural ecosystems by recycling biomass and nutrients, enhancing organic matter, and using solar energy more efficiently, thus reducing the need for synthetic fertilizers and fossil fuels, as well as minimizing the depletion of vital resources such as water and soil. This approach also focuses on enhancing crop diversity and minimizing the use of harmful pesticides by taking advantage of biological interactions and natural methods of pest control (34).

A growing body of evidence has documented the potential for agroecological methods to increase yields (5, 124) while conserving soil and freshwater, reducing water degradation, supporting wildlife ecosystems, and reducing the use of chemical inputs (5, 30, 31, 91, 124). For example, a review of 286 agricultural projects in 57 countries documented the effects of agroecological methods, such as incorporating multifunctional trees, using crop–livestock integration, leveraging ecosystem diversity for pest control, and reducing tillage. The projects exhibited an average increase in crop yield of 79% while also increasing the efficiency of water use and decreasing the use of pesticides (124). Agroecological methods have also been demonstrated to confer greater resilience against the volatility of climate change (6, 31). Beyond its on-farm benefits, agroecology can play critical parts in reducing rural poverty—e.g., by reducing farmers' reliance on external

Table 1 Examples of federal policies that support a just and sustainable food system[a]

Production	Marketing, processing, and distribution	Access and consumption	Overall food system
Remove distortions in agricultural markets that disincentivize fruit and vegetable production. Reintroduce price stabilization and production control policies. Prohibit the use of antimicrobials in food animal production in the absence of disease or documented disease exposure. Increase veterinary oversight and reporting of antimicrobial use in food animal production. Reduce the disruptive potential of commodity donations on foreign markets. Provide tax breaks, support for accessing land, and other incentives to farmers using agroecological methods. Expand coverage and increase enforcement of the Clean Water Act and Clean Air Act in food production, particularly in IFAP. Discontinue the Renewable Fuel Standard and other incentives for the use of corn and soy as biofuels. Ensure that trade agreements do not inhibit or degrade the expansion of agroecology.	Prohibit the marketing to children of foods low in nutritional value. Prohibit misleading health claims in advertising and labels on food packages. Require franchises and possibly all restaurants, retail, and wholesale establishments that sell food to provide nutritional information on menu items. Mandate contributions to a national nutrition campaign based on the amount of money spent marketing foods of low nutritional value. Leverage USDA grant programs to build infrastructure for regional and local food systems. Increase the budget for food safety oversight of IFAP, animal slaughtering and processing, and imports of seafood, fruit, and vegetables, as well as of other sectors of the food system.	Appropriate funds to fully support Farmers' Market Nutrition Programs in all states. Require food in food and nutrition programs such as SNAP to meet nutritional standards. Prioritize regional, local, and sustainably produced foods in purchasing requirements for government programs and institutions. Expand farm-to-school efforts through the Child Nutrition and WIC Reauthorization Act. Incorporate sustainability criteria into US dietary guidelines. Require that public funds used for procuring food include stipulations that require suppliers to meet certain benchmarks for sustainability, including measures of soil and freshwater conservation. Require that foods served to children through USDA programs are free of pesticides and known endocrine disruptors.	Provide tax credits for food production, processing, transportation, and retail entities that use alternative sources of energy. Establish standards for water use and water recycling in food and agricultural industries. Enforce current antitrust laws as they apply to market concentration in food system industries. Reform campaign finance regulations to help limit the disproportionate influence of corporate interests on food system policy. Leverage taxes and other means to force the industrial system to bear the costs that are currently externalized. Increase federal support for research into sustainable agriculture and food systems. Include farmworkers under OSHA regulations and enforce occupational safety laws so that agricultural workers are covered by them. Include the health impacts borne by food and agricultural workers when considering immigration reform.

[a]Parts of this table have been adapted with permission from Reference 109.
Abbreviations: IFAP, industrial food animal production; OSHA, US Occupational Safety and Health Administration; USDA, US Department of Agriculture; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

inputs (31), improving nutrition by supplying greater nutrient diversity (31), and sequestering carbon that would otherwise contribute to climate change (6, 31, 91, 124).

Despite evidence supporting agroecology, its adoption and expansion will require policies to overcome the following barriers (34):

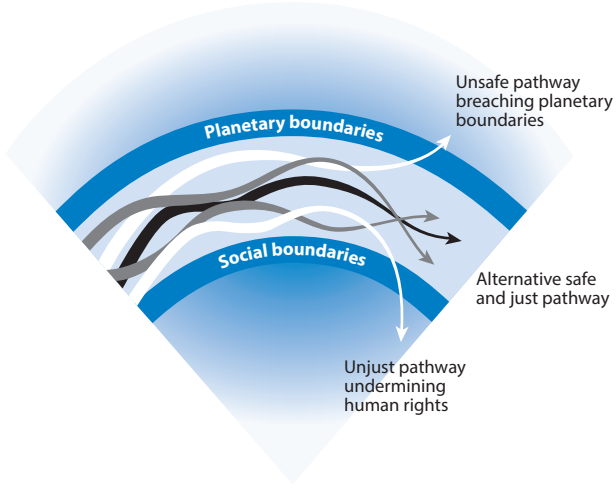

Figure 2

Possibilities for a food system within a safe and just space. Figure design by Lisa Dittmar. From Reference 87 with permission.

- the belief that agroecological approaches are not compatible with technology use and modern agriculture;
- the belief that research should focus on genetically modifying crops and developing new fertilizers and pesticides;
- the inability of small farmers to compete with larger producers who have easier access to credit, better technology, fewer transaction costs, more land security, and greater political influence;
- policies that favor trading monoculture crops within a globalized food system;
- the failure to account fully for the externalities of industrial agriculture, which hinders the proper valuation of the benefits of agroecology; and
- the vested interests that powerful organizations and institutions have in maintaining the status quo.

CONCLUSION

Our current agricultural and food policies support and perpetuate the dominant industrial model of production and govern a system that is neither healthy nor sustainable. Concerns about health and sustainability are heightened by the urgency of the need to respond to climate change, population growth, and resource depletion. Addressing the problems of our food system through policy change demands the full recognition of the interrelationships among diet, food production, ecosystems, public health, and human rights. Policy solutions that encourage healthy dietary choices, ensure food adequacy, protect food system workers, and embrace what Aldo Leopold described as a land ethic (89) will require greater political and social will from multiple sectors of our society.

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