
CHARTING GROWTH TO GOOD FOOD

DEVELOPING INDICATORS AND MEASURES OF GOOD FOOD

FINAL PROJECT REPORT

APRIL 2009

 WALLACE CENTER
WINROCK INTERNATIONAL

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– **Molly Anderson** PhD, Senior Fellow, Wallace Center at Winrock International

CHARTING GROWTH PROJECT TEAM

Project Manager and Lead Author:

Molly Anderson PhD, Senior Fellow, Wallace Center at Winrock International

Project Director:

John Fisk PhD, Director, Wallace Center at Winrock International

Core Team:

Michael Rozyne, Executive Director, Red Tomato

Gail Feenstra, Ed.D, MS, Food Systems Analyst, Sustainable Agricultural Research & Education Program, University of California, Davis

Stephanie Daniels, Consultant

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SUSTAINABLE FOOD INDICATORS

ENVIRONMENTAL TRENDS

Farmland is remaining in production



Soil quality is improving



Water contamination by pesticides in agricultural areas is declining



The nitrogen balance of US farming systems is declining



Agricultural production emits declining amounts of greenhouse gasses



Hot Spots

- Livestock wastes are potential sources of endocrine disrupting compounds to the environment.
- Agricultural lands could be a potential source of environmental steroidal estrogenic compounds when animal manure is applied over long periods.
- Estrogen contribution by livestock manure accounts for at least 90% of the total estrogen in the environment
- The 2008 dead zone is the second largest on record since measurements began in 1985 and is larger than the land area of the state of Massachusetts.
- Farmland bird populations declined in all OECD countries that report population trends between 1991 and 2004, but the decrease was less pronounced than had occurred over the 1980s.
- The efficiency ratio is the quotient of harvested food energy and energy invested in the growing process. Substantial energy losses are incurred in all modern intensive animal production

Notable Facts

- In 2006, the agricultural production sector was responsible 6% of total U. greenhouse gas emissions.
- Energy used in food processing, distribution, and wholesale and retail can be twice as large as that consumed by field farming and animal husbandry, and food preparation takes 30-50% of all the energy used in an affluent nation's food chain.
- In total, each American requires approximately 19% of the total energy use in the USA to supply their food.
- A vegetarian diet requires 33% less fossil energy than the average American diet.

HEALTH TRENDS

Death rates of diet-related diseases are decreasing



Adult overweight and obesity prevalences are decreasing



Child overweight prevalence is decreasing



Fruit and vegetable consumption meets current US dietary guidelines



The incidence of food contamination is decreasing



Hot Spots

- Type 2 diabetes in children and adolescents, although still rare, is being diagnosed more frequently among American Indians, African Americans, Hispanic/Latino Americans, and Asians/Pacific Islanders.
- There are disparities in diabetes prevalence between white and colored populations.
- Medical expenses associated with overweight and obesity accounted for 9.1 percent of total US medical expenditures in 1998.
- The CDC's National Report on Human Exposure to Environmental Chemicals shows undetectable or very low levels of aldrin, endrin and dieldrin (organochlorine pesticides that have been discontinued in the US); detectable levels of mercury in women of child-bearing age, but below the level currently associated with neurodevelopment effects in the fetus; and widespread exposure to pyrethroid insecticides.
- Agricultural use, much of it for growth promotion of livestock, accounts for 40 percent of the antibiotics sold in the United States.

Notable Facts

- Among 49 states that have data for 1994 and 2005, the age-adjusted prevalence of diagnosed diabetes was at least 50% higher in 2005 than in 1994 in 27 states.
- In 2005, only 32.6% of the surveyed US adult population consumed fruit two or more times per day, and 27.2% ate vegetables three or more times per day.
- Between 1977 and 1996, portion sizes for key food groups grew markedly in the US, not only at fast-food outlets but also in homes and at conventional restaurants.

SUSTAINABLE FOOD INDICATORS

FAIRNESS TRENDS

Farmworkers receive wages sufficient to support a household for full-time work



The percentage of farmworkers hired through labor contractors is declining



Food system workers have safe, healthy working conditions (non-fatal injuries)



Food system workers have safe, healthy working conditions (fatal injuries)



Average net farm income of small & mid-scale family farms matches or exceeds median national household income



Acreeage of mid-scale family farms is holding stable



Farmers retain a consistent proportion of the food dollar



Hot Spots

- The risk of leukemia, stomach, cervical and uterine cancers was significantly elevated in California farmworkers in comparison with the state's Hispanic population.
- Hendrickson and Heffernan have documented trends in concentration ratios: the market share controlled by top firms within a specific industry. These demonstrate an extreme level and very rapid increase in concentration in most industries.
- The proportion of non-White farms among all farms in the US fell from 15 percent in 1920 to 2 percent in 1992. The number of Black farms fell from 1 in 7 farms in 1920 to only 1 in 100 farms in 1992.
- Within a sample of agricultural workers, there was a positive correlation between urinary organophosphate metabolite levels and poorer performance on some neurobehavioral tests.
- Only one-third of Black-owned acres are operated by the owner; most Blacks rented their land to others (mainly Whites). In 1999, only 1.7% of farm owner-operators were Black, American Indian or Asian; and 1.9% were Hispanic.
- In North Carolina, a substantial number of farmworkers' children have multiple exposures to pesticides.
- In California, a study of primarily Latino children found significant correlations between six metabolites of organophosphate pesticides measured in pregnant women's urine and mental development and pervasive developmental problems in their children at 24 months of age.
- Human Rights Watch estimates that 300,000 children work in the US as hired laborers in large-scale commercial agriculture
- Child farmworkers make up only 8% of children who work in the United States, yet account for 40% of work-related fatalities among minors.

Notable Facts

- Farmworker unemployment rates are double those of all wage and salary workers. Those working in field crops have twice the unemployment rate of livestock workers.
- Poverty among farmworkers is more than double that of all wage and salary employees.
- Of all private U.S. agricultural land, Whites account for 96 percent of the owners, 97 percent of the value, and 98 percent of the acres.
- Monsanto has its genetically modified seeds for corn, cotton, soybeans and canola on more than 90% of the acreage that uses GMO seeds
- Globally, four seed firms (DuPont [Pioneer], Monsanto, Syngenta and Limagrain) have about 29% of the world market for commercial seeds.

AFFORDABILITY TRENDS

The prevalence of household food security is increasing



The prevalence of child food security is increasing



Increases in wages and salaries are equal to or greater than increases in food prices



Hot Spots

- Even the maximum levels of food stamps are inadequate to buy a healthy diet, according to current dietary guidelines.
- "Calorie-dense" foods (i.e., junk food) are cheaper overall and more resistant to price inflation than "nutrient-dense" foods.
- During the past two years when food prices rose sharply in the US, the cost of healthy staples such as milk, fruit, vegetables, bread and eggs rose significantly more than the average price increase.
- The absence of supermarkets and the inability to find quality groceries can lead to food insecurity, hunger, and obesity.
- Foods that are most likely to be missing in stores in low-income neighborhoods include the healthiest foods: fresh fruits and vegetables; whole whole grain products, such as bread, cereals and pasta; lowfat dairy products; and fish and lean meats.

Notable Facts

- Black (22.2 percent) and Hispanic (20.1 percent) households experienced food insecurity at far higher rates than the national average.
- Retail grocery-store prices leapt 7.6 percent in September of 2008 from a year earlier, driven in part by a 14.2 percent rise in cereal and bakery prices. USDA expects food prices to increase as much as 5 percent in 2009, following an estimated 6 percent gain in 2008.

INTRODUCTION TO GOOD FOOD

WHY GOOD FOOD MATTERS

We are what we eat; and, through eating, we re-make our world according to what we are. It is hardly surprising that a country where ever-higher levels of material consumption are prized as signs of status and progress is showing the impacts of over-consumption in our bodies, in our national budget and individual credit-card balances, and in our land and waters. Fast food consumption has surged since the first McDonald's opened as a walk-up stand in 1948, featuring 15-cent hamburgers, french fries, milkshakes, coffee and Coca-Cola. The roads into every major US city have become anonymous strip-malls studded with the same ubiquitous fast food outlets; and in many low-income neighborhoods, fast food is more convenient and less expensive to buy than healthy fresh produce. Obesity and overweight have reached epidemic levels. Many environmental problems caused by the food system persist or are getting worse: for example, excess nutrients pouring into the Gulf of Mexico created the largest hypoxic zone ever in 2008, damaging a valuable fishery that was once called the "Fertile Crescent". Wages and working conditions of farmworkers, whose backs support the US fruit and vegetable industry, have been stagnant for decades at levels far below average household wages or conditions deemed acceptable in other industries. Price volatility has been wreaking havoc on farmers in the US, despite recent high prices because of speculation, biofuel demand, and the global food crisis.

Changing US food consumption patterns is an undeniable part of the solution to pressing and persistent environmental, health and social problems associated with the US food system, but attention to how this can be encouraged is relatively new. A growing number of people are looking at the interlinked processes of production and consumption, and examining the entire life-cycle of food products, in the search for more sustainable ways to live on the planet.

CONTEXT

The Charting Growth Project began at the Wallace Center in late 2006, with funding from the Food and Society Initiative (FAS) of the W.K. Kellogg Foundation (WKKF). FAS was launched in 2000 as part of the Food Systems and Rural Development program of WKKF, with the vision of "a future food system that provides all segments of society a safe and nutritious food supply grown in a manner that protects health and the environment and adds economic and social value to rural and urban communities". The purpose of FAS is "to support the creation and expansion of community-based food systems that are locally owned and controlled, environmentally sound, and health promoting". FAS projects focus on three primary areas: market-based change, institutional support, and public policy.

In 2005, FAS made the decision to set a goal of increasing the level of "good food" in the US to at least 10% of the total food purchased, with the assumption that this would be a critical tipping point at which further growth would accelerate due to market forces (Figure 1).

Food and Society Theory of Change (From 2% to 10%)

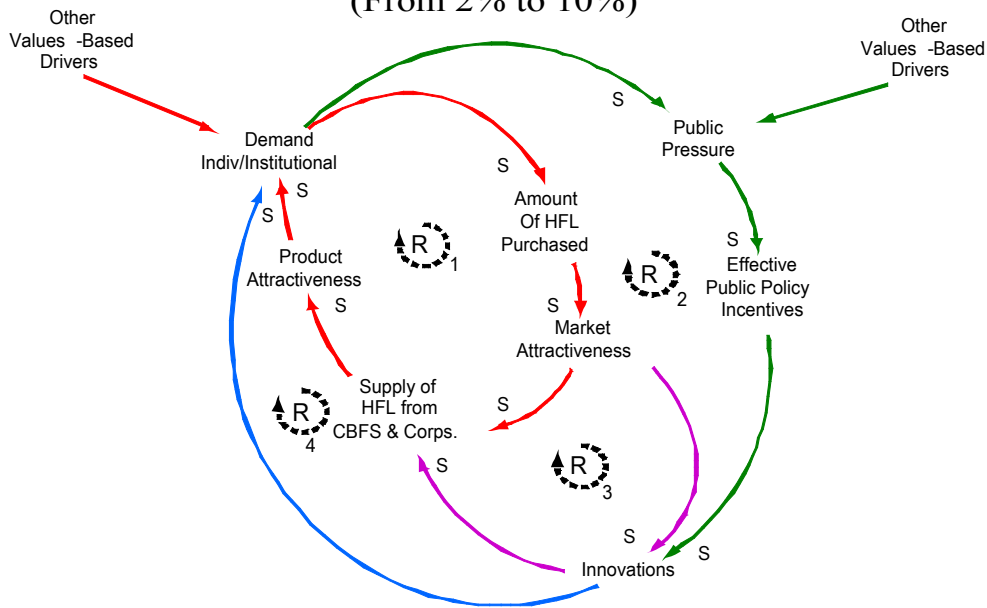


Figure 1.

In this diagram, “HFL” refers to “Healthy, Fresh and Local”, the attributes of good food under consideration when this theory of change was developed. In essence, FAS posited several reinforcing loops “virtuous” (R): growth in individual and institutional demand for good food is augmented by both public policy and technological innovations. As demand rises, supply from both food corporations and community-based food systems (CBFS) will grow to meet it and further augment the growth in demand, which will lead to even greater demand for supportive public policy and innovations. At approximately 10% of food supply, the food system might reach a “tipping point” at which this loop would continue to be self-reinforcing without the need for steady infusion of donor funds. This theory focuses on demand, not supply.

But exactly what is “good food”, and how would its growth be measured? After the theory of change in Figure 1 was created, FAS made the decision that the key attributes of good food would be healthy, fair, green and affordable. This decision was based on experience funding community-based and national organizations working in sustainable agriculture and community development since the inception of FAS. By adopting the growth of good food as its mission, FAS joined others calling for a simple, clear description of the goals of food system reform. The plethora of health and environmental claims that have been made recently for different food products generated consumer confusion; in response, interest rose in a simple concept such as “good food” or “real food”. But while “good food” sounds simple, making the concepts of healthy, fair, green and affordable operational in such a way that they can guide grant-making is far from straightforward.

In 2008, the overarching mission of WKKF became “to support children, families, and communities as they strengthen and create conditions that propel vulnerable children to achieve success as individuals and as contributors to the larger community and society.” The foundation has retained its commitment to good food as it seeks to address the conditions that impact vulnerable children, families and communities. A healthy diet and well-functioning food systems to supply it are essential needs; and many children in the US suffer the effects now of poor diets that affect their cognitive capacity, health and ability to function.

CURRENT US FOOD SUPPLY AND BARRIERS TO GOOD FOOD

How much of the US food supply is “good food” at present? Answering this question with some precision requires not only an operational definition of good food, but also an understanding of food sources and flows in the US. This section provides an overview of data sources on the US food supply, and how various aspects have changed over time.

Some of this information is available in the public domain through data and reports generated by US Department of Agriculture’s Economic Research Service (ERS), but much remains unknown. For example, ERS tracks the amount of several hundred different kinds of foods and their nutrients that are available for consumption per capita, but not how much is actually consumed. Core Food Availability data are a continuous series extending back to 1909 for many commodities. The data are calculated for each food or commodity as the sum of annual production, beginning stocks, and imports minus exports, ending stocks, and nonfood uses. Per capita estimates are calculated by dividing the total annual food supply of a commodity by the US population that year. The series indicates whether people in the US, on average, are consuming more or less of various foods over time. But the availability data overestimate consumption, because they do not account for spoilage and waste in the marketing system and at home. In the mid-1990s, ERS devised ways to adjust the data for spoilage and waste. They estimated that this cuts the amount of calories actually available for consumption by about one-third, although the amount varies by commodity. For example, spoilage and waste for fresh apples from the farm to consumer are an estimated 39%, but for cheddar cheese only 18% (Wells and Buzby, 2007).

Data on what people in the US actually buy and eat come from two primary sources: industry databases on the amount of food sold and consumption surveys. USDA conducted analyses of food commodity consumption, the Continuing Survey of Food Intakes by Individuals (CSFII), during 1994-96 and 1998. ERS researchers used this dataset to establish a baseline for tracking US food and commodity consumption. The CSFII was integrated into the National Health and Nutrition Examination Survey (NHANES), which was conducted by the Centers for Disease Control and Prevention of the US Department of Health and Human Services.

NHANES is a better current source of data on consumption than industry data, even though it is based on self-reports which are notoriously faulty, because data on sales do not account for waste through home storage, preparation and plate-waste. Furthermore, data on sales are not always publicly accessible and not consolidated consistently across retailers. In addition, a percentage of food consumed by people in the US comes from non-sales venues, such as private emergency food assistance (pantries and food banks), bartering arrangements, or home and community gardens. Demand on food banks and pantries across the US has gone up drastically over the last year due to the combined pincers of economic recession and rising food prices. The all-food Consumer Price Index (CPI) increased 5.5 percent between 2007 and 2008, the highest annual increase since 1990. Food-at-home prices, led by fats and oil prices (up 13.8 percent) and cereal and bakery product prices (up 10.2 percent), increased 6.4 percent; and food-away-from-home prices rose 4.4 percent in 2008 (ERS, 2009). Not surprisingly, the numbers of people who are food-insecure, or unable to reliably access enough food for active, healthy living, have soared over the last two years. A preliminary study by researchers at Boston University found that US food insecurity jumped 30% in the first six months of 2008, compared to the same period in 2007. The proportion of meals that people in the US obtain from private emergency food assistance providers versus through purchase at supermarkets, home or community gardens, bartering, or other means is not known.

How fair is food distribution, and how fair is the distribution of impacts due to ways that food is produced, processed and distributed? How fair are businesses that make money in the food system to their employees? These questions are difficult to answer because fairness is a nebulous and contentious concept. Although the US prizes its legacy as a land of opportunity, where even the son of an African immigrant can become president, it is also a country riddled with health, educational and income disparities. In few sectors is this so glaring as in food industries. Farmworkers earn wages far below the poverty level and have shortened life expectancies because of dangerous working conditions. They are excluded from the National Labor Relations Act, which provides basic worker protections in other sectors. At the same time, some of the richest people in the US gained their wealth from Wal-Mart, the largest grocery supplier in the country.

Where is the food that comprises the US food supply produced and processed? An approximate answer comes from import data reported by ERS. The aggregate import share of US food consumption in 2005 was 7 percent when based on value, but 15 percent based on volume (Jerardo, 2008; Figure 2).

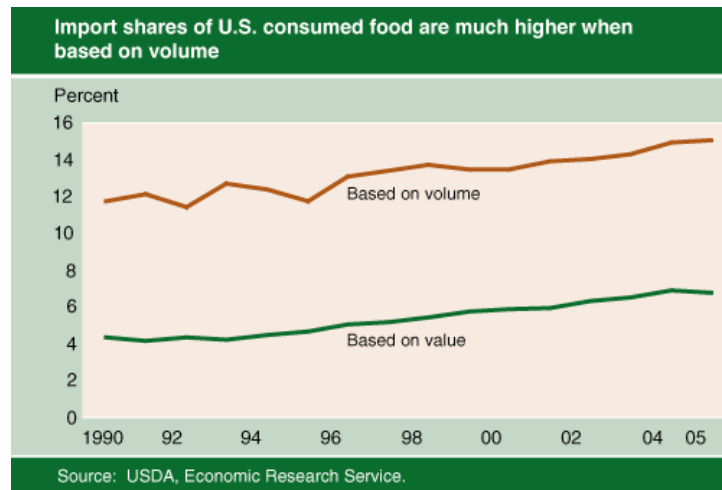


Figure 2. Import Shares of US Consumed Food.

These aggregate figures mask significant difference across commodities (Figure 3). For example, 79% of fish and shellfish consumed in the US is imported but only 3% of dairy products.

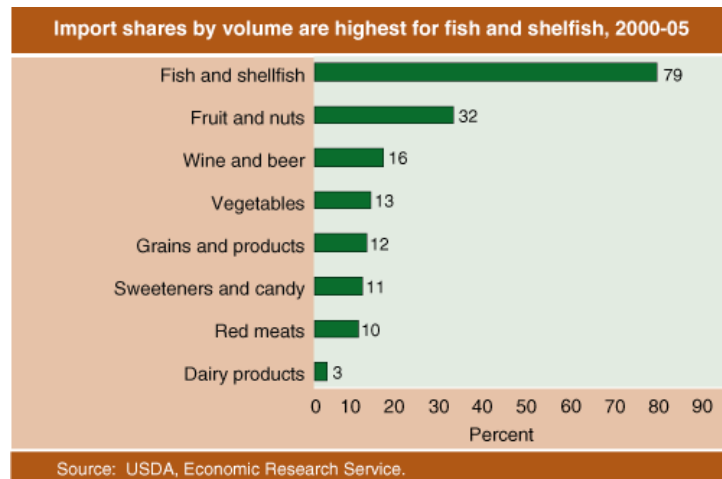


Figure 3. Comparison of Import Shares by Volume across Selected Commodities.

Where food is produced and processed matters to the question about supply of good food, because knowledge about the consequences of production, processing and distribution on people and the environment is more limited for imports, especially those from developing countries. Due to aggregation of products, it is sometimes difficult to trace exactly where imports were produced or processed. And even when traceable, the data on environmental and social impacts of agriculture in developing countries is often scanty or poor quality. Health concerns are also different for imported food; it is subject to a different system of monitoring than food produced in the US, and the ability of the Food and Drug Administration to test imported foods is weak.

What kinds of food do people in the US eat, and how has this changed over time? Fruit and vegetable consumption is especially important because higher frequencies of consumption are associated with lower risk of several chronic diseases, such as cardiovascular disease, diabetes, and some cancers. The frequency of fruit and vegetable consumption changed little in the US from 1994 through 2005 (Blanck et al., 2008), despite growing awareness of the importance of fruits and vegetables in a healthy diet. The National “5 A Day for Better Health” program started in 1991, and nutrition education has focused on increasing fruit and vegetable consumption since then.

Meat consumption has come under attack increasingly because of concerns about greenhouse gas emissions from livestock production. One of the top recommendations to consumers for diminishing their impacts on global warming is to eat less meat (first suggested in a popular publication in Brower and Leon, 1999). However, meat consumption has been rising rapidly worldwide. In the US, poultry consumption grew and beef consumption declined somewhat between 1980 and 2005 (Figure 4), but we do not yet have data to show whether concerns about greenhouse gas emissions are stimulating any decrease in meat consumption overall.

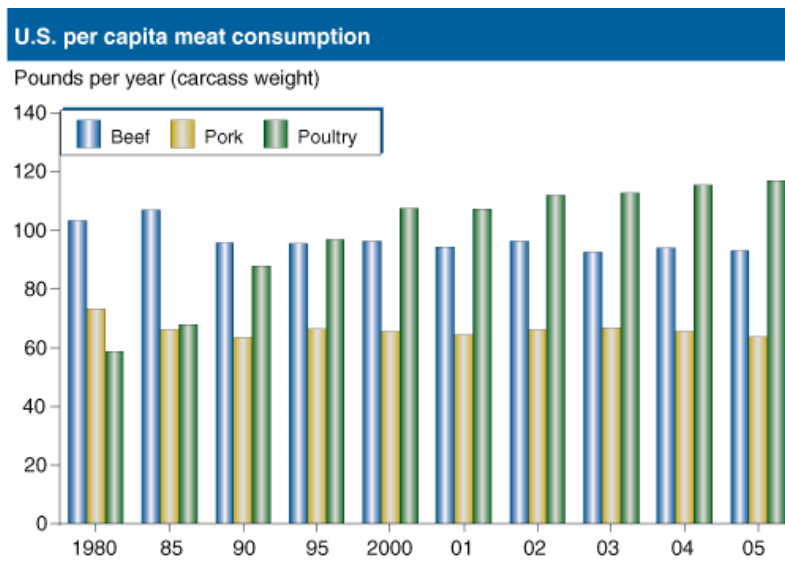


Figure 4. US Per Capita Meat Consumption 1980-2005.

What does this short sketch of trends in the US food supply tell us about good food supply? At the very least, they indicate that tracking food supply in general is complex and that multiple factors, many of them unknown and unknowable to US consumers, affect how healthy, fair, green and affordable the US food supply is. They also raise some questions about the attributes of good food, barriers to making good food accessible to everyone in the US, and the theory of change underlying the original charge for this paper.

Data on food insecurity juxtaposed with data on changes in the Consumer Price Index suggest that “affordability” might be a problematic concept: food insecurity seems to be rising much faster than the CPI for food. So the price of food appears to interact with other factors to affect food access. The discrepancy between public policy encouraging consumption of fresh fruits and vegetables and actual consumption rates suggests that behavior changes, and change in demand, might be responding to other factors that overwhelm or counteract the effects of public policy. So this virtuous circle is not as simple as it seems. The large proportion of imported foods in the US food supply tells us that changing US food consumption patterns might not have a direct effect on improving environmental impacts from food production and processing in the US. Effects depend on which products are consumed more or less, and their source. The trends outlined here informed many of the methodological decisions of the Charting Growth project.

PROJECT APPROACH

Wall Street interests have defined not only the structure of our economy but also the indicators by which we assess its performance. Focused on financial indicators, we accept that the economy is sound even when it is killing us. Real-wealth indicators of the health and well-being of our children, families, communities, and natural systems reveal terminal systemic failure. Since we get what we measure, we should measure what we want. (Korten, 2009, pg. 89)

PROJECT GOAL AND OBJECTIVES

The goal of the Charting Growth Project was to develop indicators of good food, for use by WKKF's FAS Initiative. Its objectives are to:

- Define healthy, green, fair and affordable as attributes of the system for WKKF.¹
- Develop a broadly credible set of national indicators of good food for WKKF and simple, readily comprehensible ways to display them.
- Use the indicators to assess the current availability of good food in the United States.

Although many people have worked on indicators of sustainability and sustainable development, applications to food systems are relatively new. A small team² reviewed the related literature and interviewed numerous experts on food systems and WKKF's selected food attributes to develop definitions, indicators, and measures. Many of the people we interviewed and other stakeholders gave useful feedback on an earlier draft of the definitions, indicators and measures. We incorporated many of their suggestions in a draft that was posted on the Wallace Center website for public comment in December 2008. In late January, we posted a questionnaire on the Wallace Center website and distributed an invitation to review the draft indicators to FAS Project Directors, the FAS Policy Fellows listserv, additional Wallace Center contacts, and on the Community Food Security Coalition's listserv (COMFOOD-L).

The term "indicator" is used in many different ways in the literature, to mean anything from a broad goal to a data point. We use the term in this project to mean a positive change in attributes of interest—in our case change toward greater health, fairness, "greenness" (environmental quality), or affordability of the US food supply. In other words, our indicators are short statements of conditions that would indicate that the US food supply is indeed healthy, fair, green and affordable. We decided to select positive indicators because we think that they can help people to envision a healthy, fair, green and affordable food supply. Without specific ideas about what success would look like, we are unlikely to achieve it. This is the approach promoted by Yellow Wood Associates through its You Get What You Measure indicator development methods, which influenced this project and have helped to motivate strategic action through indicator development for numerous organizations and communities. We use the term "measure" to mean the data showing change in an indicator over time. For each attribute, there are several possible indicators; and for each indicator there may be several possible measures.

INDICATORS CRITERIA AND FRAMEWORK

In selecting the best indicators from multiple possibilities, we used criteria that many other indicator development projects have used.

Indicators (the statements about positive change) should:

- be **measurable**
- be **relevant** to the attributes of interest
- address the **most important trends and impacts** related to these attributes

¹

² Project Director John Fisk, Project Manager Molly Anderson, and Core Team Members Gail Feenstra, Michael Rozyne and Stephanie Daniels, with research assistance from Sarah Borron and Simca Horwitz

- be **sensitive/responsive to changes over time** in physical conditions
- be **hierarchical** (providing a clear overview, but amenable to expansion into detail or at finer scales)
- **promote learning and effective feedback to decision making**

Measures (the data supporting the indicators) should be:

- **valid and reliable** (high quality)
- **timely** (indicating problems or progress while there is still time to act to prevent negative consequences)
- **collected and reported regularly and consistently over a broad geographical range** of the US
- **publicly available**
- **transparent** and understandable

Recognizing that many indicator development projects have generated such large and complex sets of data that they are never used, we also wanted to keep the indicators and measures we selected simple. Therefore, our indicators do not include all impacts or even all of the negative impacts—only the ones we judged to be most important according to the criteria. In selecting measures for the indicators, we gave priority to data that are valid, reliable and transparent because we wanted the indicators to have broad credibility and legitimacy.

Indicators can include a tremendous number of possible data, so it is important to begin with a sense of the system that we are trying to analyze and how the pieces fit together functionally. A common way to conceptualize indicators systemically is by selecting them from important drivers, pressures, states, impacts and responses (DPSIR) within the system of interest. This is an extension of the Pressure-State-Response (PSR) model originally developed by the Organization for Economic Cooperation and Development (OECD), and has been adopted by the European Environment Agency and several United Nations agencies. The following diagram (Figure 5) shows this framework for the food system, with some of the important components listed.

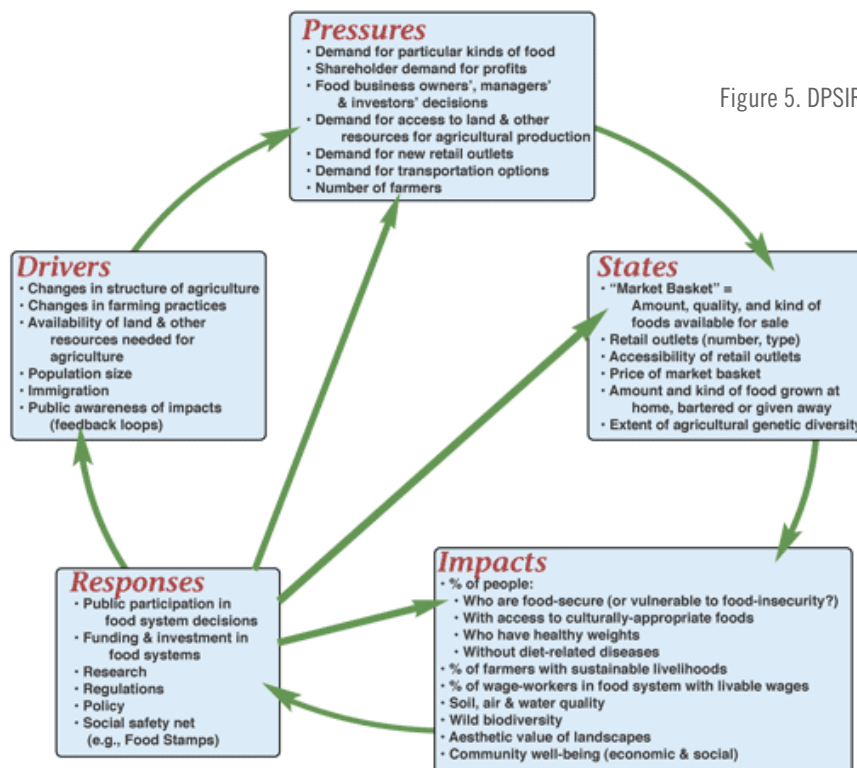


Figure 5. DPSIR Framework of Food System.

MAJOR PROJECT DECISIONS ON METHODOLOGY

Our charge was to select credible, legitimate indicators to estimate the amount of “good food” available at any given time, with the end goal of drawing meaningful inferences that might guide action. We took this charge seriously, but in the end we decided it is impossible. There are at least four insurmountable problems with this charge. First, the most legitimate measures and indicators according to our criteria usually deal with impacts rather than states; but the amount of “good food” available is a state variable. Impact indicators show the cumulative effects of multiple states over time, including the amounts of “good food” produced, processed, distributed, sold, purchased, consumed and wasted. The original charge from FAS focused on a single state within this system: the amount of “good food” available in the US. In the diagram below (Figure 6), we show, in yellow, the part of the food system where FAS’s mandate is focused (the amount in sales and non-sales distribution outlets) and this state variable in relation to the entire food system.

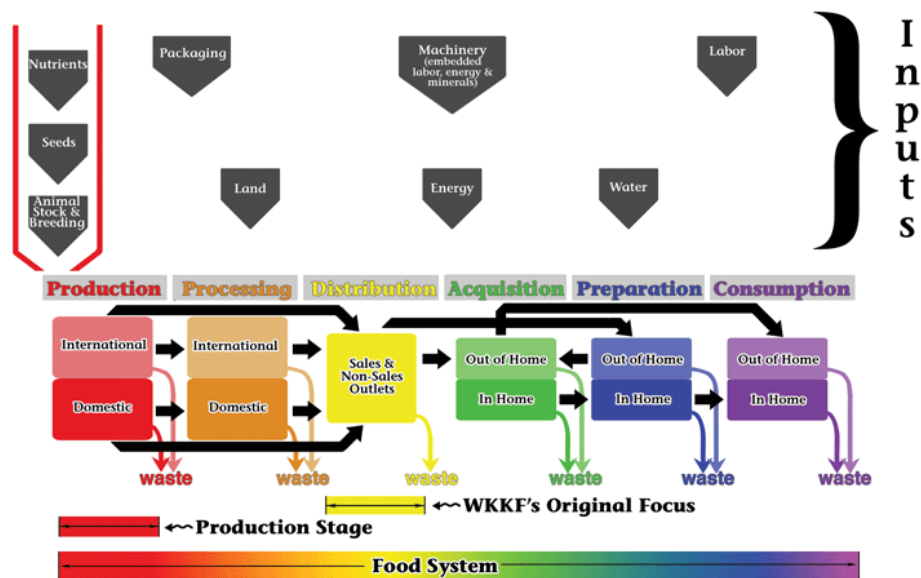


Figure 6. Food System Activities.

Most agricultural indicators focus on production activities. But we consider the impacts of interrelated activities in the food system, from food production through consumption to be important. In our list of indicators, we show the food system activities each indicator represents: food production, processing, distribution, sales and purchasing, and consumption. By focusing on impacts of the whole system rather than a single state, we captured much more of the food system (including the impacts of approximately 30% of food that is wasted). Our indicators only deal with conditions in the US, however; so we do not capture the impacts of international production and processing of food that enters the US food supply. We made this choice because the FAS Initiative is domestic, although the entire WKKF funding portfolio addresses agricultural activities in other countries.

A second and closely related issue is that we had to look beyond food products to the food system in order to define the attributes of interest to this study. Even attributes that might at first glance seem to describe a food product—“healthy” or “affordable”—depend in fact on systemic attributes: foods are healthy in the context of an entire diet and activity level, and affordable in the context of wages and other household costs. While we emphasized impact indicators, we included a few indicators from other parts of the framework.

Our criteria for indicators and measures along with the first two problems discussed above had big implications for the methodology we chose. Rather than determining attributes of a “market basket” of typical foods, a reasonable approach had we been interested only in the “good food” available in sales and non-sales distribution outlets, we relied on national data about impacts. The market-basket approach is appropriate for other research questions, of course; but it would have required that we use retail data based on Stock-keeping Units (SKUs) embedded in bar codes on food products to find the proportion of certain types of food that are flowing through retail outlets. These data deal with only one state in the food system, and their interpretation would depend entirely on filters we—or the retailers who own the data—assigned to determine what is healthy, green, fair and affordable. In contrast, we wanted indicators that are transparent, based on publicly accessible data, and open to interpretation by the stakeholders. We used national data, but most of the impacts that our indicators show are apparent at more refined geographic scales. Therefore, many of the indicators we selected are applicable at state or local levels.

The third issue with our original mandate is that the four food attributes are not additive, so giving a single number for the amount (or percentage) of good food available is not possible. FAS selected these attributes precisely because they deal with different dimensions of food. Collapsing the dimensions into a single number would be misleading, because it might allow poor performance along one dimension to be traded off with good performance on another dimension.

A fourth and related issue is that each food attribute requires a goal or target to determine whether we as a society are “on track” to a good food supply. A goal or target is different from a definition. For example, we defined “healthy” in relation to food’s intrinsic properties and safety, as affected by how it is produced and handled. But the threshold values for various indicators of those intrinsic properties and food safety are value judgments that society must make: selecting them is not the prerogative of “experts”. We suggested decreasing prevalence of diet-related disease as an indicator of healthy food and food systems, but the best we can do in this project is to depict the trend. We do not have the authority to say how much diet-related disease is tolerable to society, or the point at which the prevalence of diet-related disease shows clearly that the food supply is unhealthy. Setting legitimate goals for food systems can be done only through a multistakeholder participatory process.

As we tried to come to terms with internal contradictions of our charge, we opted for legitimacy based on robust data on cumulative impacts. This ruled out the choice of building a set of indicators for the amount of food for sale in retail outlets, and using proprietary, non-transparent or inconsistent data. We sought the most complete and valid data in the public domain, and avoided simplistic proxies such as equating “green” with the amount of organic food produced or the amount of US farmland in organic production. In addition, we avoided indicators that relied on complex calculations or highly technical information because we wanted the indicators to be readily comprehensible. Where our indicators match those in other prominent indicator development projects, we tried to use the same measures for comparability. The latter consideration was most relevant for “green” indicators, because there has been much more domestic and international work on indicators associated with agriculture’s environmental impacts than impacts associated with the other attributes.

After we had determined the priority criteria for indicators, we still had several decisions to make about project methodology. The first was whether indicators should apply at the national level and/or at other scales. Many of the projects funded by the FAS Initiative were community-based; WKKF has enabled community-based solutions to agricultural problems to thrive in a national context that has favored large-scale businesses or explicitly “scale-neutral” solutions. WKKF clarified that the current need was for national-scale indicators, but we also gave some attention to whether these indicators would be appropriate at other scales.

To select possible indicators, several pathways were possible. There has been growing interest in participatory indicator development and the Project Team explored this option by developing a work plan to compare indicators of food system sustainability or good food that different potential users (food industry, community-based organizations, government agency staff and academicians) generate. The funder expressed a preference for an expert-driven approach in order to focus the work on a national level set of indicators and measures with credibility in conventional forums. As a result we developed a list of experts in each food attribute the project intended to focus on (healthy, green, fair and affordable) and used a semi-structured questionnaire to interview these

experts by phone, e-mail or in person. We created a snowball sample by asking each informant to provide names of other experts who could provide useful information about how the good food attributes are measured in the US and the quality of data available. We interviewed 48 people, meanwhile comparing notes within the Project Team about what we were finding. A set of draft indicators with a short introductory section describing project goals and indicator criteria were circulated to 54 people, and also presented at two small sessions at the Community Food Security Coalition conference in order to get input from community-based organizations about their potential applicability. We received responses to the draft from 24 people and modified the draft according to the recommendations we had received. We posted the draft on the Wallace Center website in December, 2008. The implications of the methodology we used and what we learned are addressed later in this report, in the section on “Lessons Learned.”

We selected two types of indicators: the first type, National Indicators, points to aspects of the food system that are most critically in need of immediate action by policy makers in order to achieve the attributes of a “good food” supply. None of these indicators is ideal, and we note some of their limitations. We hope that showing the best that can be done with publicly available data will help to illuminate information gaps that must be filled by collecting new information and/or restructuring existing data collection in order for society to track the sustainability of food systems adequately. This is a vitally important endeavor and deserves far more attention and resources than have been devoted to date.

This first set of indicators is supplemented with a second set indicating the success or growth in Promising Innovations. While the first set points to current problems that must be addressed, the second set points to possible solutions, often pilot programs that could be replicated more widely and that contribute to improvement of more than one attribute of good food. Promising Innovations also tend to span multiple food system activities more often than the National Indicators.

We also highlighted “Hot Spots”: places or situations in which impacts of the lack of healthy, fair, green and affordable food and food systems create especially serious conditions that need attention. We gave priority to impacts of the food system that affect children’s vulnerability, since this is WKKF’s current emphasis. The measures for Promising Innovations and Hot Spots did not necessarily meet all of our criteria, but National Indicators are not sufficient alone for guiding decisions about the food system. Much of the data we would like to see is not available, and the National Indicators do not capture potential solutions to problems or important emerging issues. While we could not point to all of these with the Promising Innovations Indicators and Hot Spots, they highlight some we think are especially noteworthy.

Healthy, fair, green and affordable are important food attributes; many citizens would agree that we want a food system that can be described in this way. Selecting indicators for these attributes and evaluating the available data about them are important steps toward linking sustainable production and consumption in the US food system. For too long, the discussion about sustainable agriculture in the US has been focused on just production. The FAS Initiative and this project help to overcome that narrow perspective by considering how sustainability must be achieved in both production and consumption of food.

The literature review that we conducted as part of the Charting Good Food project emphasized that participatory processes are necessary in order to get buy-in from people who must implement changes in a system. This kind of process has not happened at the national level in the US so far, so our indicators should be viewed as a starting point for measuring sustainability in the US food system. Much more public dialog will be needed to define the most important and credible attributes of sustainable food systems. The final section of this report, Beyond Good Food, lists some other attributes suggested by advocates of sustainable food and sustainable food systems that do not seem to fit clearly under healthy, green, fair or affordable.

In the following sections, we suggest definitions of healthy, fair, green and affordable, including distinct dimensions or aspects of each; the rationale by which we determined the most critical impacts for each attribute; and our recommended National Indicators and accompanying measures. Additional criteria were necessary for each attribute to narrow down the choice of indicators. These are designed to make sense to most US consumers, but may en-

courage them to consider impacts of the food system of which they were not previously aware. We explain why we selected each indicator and measure, and note limitations. After the National Indicators, we list Promising Innovations, then Hot Spots. We also list some of the indicators of each attribute that we considered and would have liked to include but could not because of data limitations.

SUGGESTED DEFINITIONS WITH INDICATORS AND MEASURES

Healthy

Definition: Healthy food makes a significant contribution to a healthy diet and does not cause diet-related disease under normal circumstances. Dimensions of healthy foods are their intrinsic properties (such as being whole and minimally processed) and safety, which is affected by their journey through the food system and how they are handled at each stage. The additional criteria we used to focus health indicators are impacts on loss of human life, significant loss of quality of life (such as through sickness), and public cost.

NATIONAL INDICATORS – HEALTH

(See Appendix 1 for Trends):

(1) Death rates of major diet-related disease prevalence are decreasing. (Food system activity = consumption)

Measures: death rates of diet-related diseases that are among the top causes of US mortality (heart disease, cancers, stroke, diabetes). Source: National Vital Statistics Reports, Centers for Disease Control, National Center for Health Statistics for leading causes of death <http://www.cdc.gov/nchs/fastats/deaths.htm> and mortality associated with each; World Cancer Research Fund (2007) for links between specific cancers and diet.

Explanation: While the top causes of mortality used to be infectious diseases and accidents, chronic diseases associated with diet have moved to the top of the list. In part, this is because people are living longer; but poor diets clearly play a role as well. A larger proportion of the population eating healthier foods should be reflected in lower death rates (deaths per 100,000 people) of diet-related disease.

Limitations of this measure: We rely on expert judgment to show the degree of certainty that diet is linked to specific types of cancer. New scientific evidence may show stronger or weaker correlations, as causal mechanisms are better understood. Between 1998 and 1999, the method of reporting age-adjusted death rates changed, making direct comparisons difficult. In addition, the national mortality register includes some unknown proportion of misdiagnosed or misreported causes of mortality.

Limitations of this indicator: Death rates do not mirror disease prevalence; increasing numbers of people may have a disease but the death rate may go down rather than up because of improved treatment options. Each diet-related disease has complex causal genetic and environmental factors in addition to diet. The links between diet and disease are not fully understood yet, and some diseases that have been considered diet-related may have other primary causal factors. For example, reported links between diabetes and environmental contamination have gotten renewed interest lately (Jones et al., 2008).

(2) Adult overweight and obesity prevalence are decreasing. (Activity = consumption)

Measures: prevalence of adult overweight and obesity. Source: Centers for Disease Control, National Center for Health Statistics, National Health & Nutrition Examination Survey (NHANES; overweight and obesity incidence reported in 2-year periods, latest posted data 2003-4)

http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overweight/overwght_adult_03.htm.

Explanation: Rapid increases in the prevalence of overweight and obesity have led to serious concerns in all industrialized countries, and increasingly in developing countries as well. Overweight and obesity are highly correlated with several diseases, and the individual and social costs of coping with and treating these diseases are large.

Limitations of this measure: NHANES has the usual limitations of self-reported consumption data and is available only in 2-year intervals. It is preferable to the Behavioral Risk Factor Surveillance System, which also includes obesity estimated, because it is based on actual measurements of height and weight rather than self-reports.

Limitations of this indicator: Obesity and overweight are due to many factors, including lack of physical activity and genetic predisposition. Eating healthier foods may not reduce obesity and overweight unless other social and life-style characteristics change too. New research shows that obesity and overweight are not perfectly correlated with diet-related disease. People who are obese but physically active have reduced risks of diet-related disease.

(3) Prevalence of childhood overweight is decreasing. (Activity = consumption)

Measure: Prevalence of children and adolescents aged 2-19 with sex-and age-specific BMI \geq 95th percentile based on the CDC growth charts. Source: Centers for Disease Control, Center for Health Statistics, National Health and Nutrition Examination Survey (NHANES <http://www.cdc.gov/nccdphp/dnpa/obesity/childhood/prevalence.htm>).

Explanation: The increase in childhood overweight is a serious public health concern because children who are overweight have a high likelihood of becoming obese or overweight adults, and having diet-related diseases. We separate childhood overweight from adult overweight because they are measured differently and have different consequences.

Limitations of this measure: NHANES has the same problems that any self-reported study of food consumption does, such as recalling consumption correctly and reporting it accurately. See comparisons of methods for assessing dietary intake in Institute of Medicine (2002). Results are reported in two-year cycles, so year-to-year changes cannot be detected.

Limitations of this indicator: Obesity and overweight are due to many factors, including lack of physical activity and genetic predisposition. Eating healthier foods may not reduce obesity and overweight unless other social and life-style characteristics change too.

(4) Fruit and vegetable consumption meets current US dietary guidelines. (Activity = consumption)

Measures: average fruit and vegetable consumption per day for people age 2 and older Sources: Dietary guidelines for fruits and vegetables from USDHHS/USDA (2005); average fruit and vegetable consumption per day from the Behavioral Risk Factor Surveillance System, which has been better analyzed and reported in the public domain and scientific literature than consumption data from NHANES. We used results reported in Blank et al. (2008), previously reported in the Centers for Disease Control's Morbidity and Mortality Weekly Report.

Explanation: Fruits and vegetables are the food category that is most underconsumed in the typical US diet. Fruits and vegetables provide essential nutrients, and their consumption is correlated with reduced risk of developing many diseases. Diets including a large proportion of fresh fruits and vegetables usually have lower overall caloric intake due to their higher water and fiber content, which appeases hunger.

Limitations of this measure: BRFSS has the same problems that any self-reported study of food consumption does, such as recalling consumption correctly and reporting it accurately. See comparisons of methods for assessing dietary intake in Institute of Medicine (2002).

Limitations of this indicator: Fruits and vegetables are only part of a healthy diet, even though important. Recommended consumption amounts are based on current scientific judgment, and may change in the future.

(5) The prevalence and cost of food contamination are decreasing. (Activity = consumption)

Measures: prevalence of foodborne disease. Source: Centers for Disease Control, FoodNet (Foodborne Diseases Active Surveillance Network), reported as preliminary data for 10 states in 2007 in Morbidity and Mortality Weekly Report (2008); cost to society of food contamination. Source: USDA, Economic Research Service, Foodborne Illness Cost Calculator <http://www.ers.usda.gov/Data/FoodborneIllness/>

Explanation: Food-borne illnesses are a serious health problem, associated with many food categories (recent outbreaks have been traced to contaminated meat, spinach and peppers). New and more virulent pathogens are appearing, in part due to globalization. While other sources of food contamination, such as pesticide and hormone residues on food, are also of grave concern, microbial contamination has greater impacts in terms of loss of life, sickness and cost to society (the criteria we used to assess health impacts).

Limitations of this measure: The FoodNet data are not reported across the entire country, and annual reports are not readily available. Not all foodborne diseases are reported, and often people are not even aware that an illness is foodborne. The Foodborne Illness Cost Calculator includes only a few pathogens, and data for others are not current. As an indicator of food contamination, FoodNet data are incomplete because they do not include pesticides, growth hormones, and other undesirable food additives.

Limitations of this indicator: Regulations to promote food safety may have negative effects on other food attributes. For example, some regulations end up eliminating smaller producers from markets because they cannot afford to install safety equipment. The costs of assuring food safety may also be forced onto farmers or workers, rather than spread across food system actors. Regulations intended to prevent food contamination may also effectively diminish the wholesomeness of food or create health hazards for workers, as in irradiation of fresh foods to prevent bacterial contamination that might be contained through other measures.

HEALTH HOT SPOTS

(See Appendix 1 for Trends):

(1) Prevalence of Type II diabetes in children aged 10-19. Source: Centers for Disease Control, SEARCH for Diabetes in Youth Project http://www.cdc.gov/diabetes/projects/diab_children.htm

(2) Disparities in diabetes prevalence between white and colored populations (especially Native Americans). Source: "Number of people with diabetes increases to 24 million". Centers for Disease Control Press Release, 24 June 2008. <http://www.cdc.gov/media/pressrel/2008/r080624.htm>. Also Agency for Healthcare Research and Quality, US Department of Health and Human Services <http://www.ahrq.gov/research/diabdisp.htm#HighDiabetes> for information on complication rates.

(3) Cost to society of overweight and obesity. Sources: Finkelstein et al. (2003, 2004). Also Centers for Disease Control. http://www.cdc.gov/nccdphp/dnpa/obesity/economic_consequences.htm

(4) Pesticide body burden (pesticide levels in the bloodstream or urine). Source: Centers for Disease Control, Center for Health Statistics, National Health and Nutrition Examination Survey (NHANES) http://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/128ocp_c.pdf (The most recent data available is on organochlorine pesticides from 2003-2004, released April 2008.) Also see The Third National Report on Human Exposure to Environmental Chemicals at <http://www.cdc.gov/exposurereport/pdf/thirdreport.pdf> for reports on a wide range of pesticides found in blood or urine, as well as heavy metals that may be ingested in food.

(5) Prevalence of antibiotic resistance due to animal agricultural production. Source: Keep Antibiotics Working (2007)

Notes: For hot spots, we wanted to highlight issues that raise particular concerns about the health of children and future generations. We include the prevalence of Type II diabetes and overweight in children here rather than in National Indicators because data interpretation differs between children and adults. Identifying Type II diabetes in children is somewhat difficult; this is why the CDC has initiated a new project to detect new cases.

Discrepancies in the prevalence of diabetes between white and colored populations point to serious factors including poverty that increase the health vulnerability of children of color.

The estimated cost to society of overweight and obesity relies on several assumptions such as life expectancy of individuals with each diet-related disease, costs of treatment, costs of lost productivity, and costs of insurance to employers. We were not able to find reliable trend data that showed clearly whether these costs have gone up or down recently.

The prevalence of antibiotic resistance due to sub-therapeutic use of the same antibiotics in animal operations points to a health issue (rising antibiotic resistance because of overuse of antibiotics) but also the growing use of animal facilities in which there is so much crowding that animals must be medicated sub-therapeutically to prevent outbreaks of disease. This model of confinement livestock facilities is spreading rapidly in the US and to other countries; but we see it as unsustainable by environmental, health and social criteria.

OTHER HEALTH INDICATORS CONSIDERED BUT NOT INCLUDED:

(Many of these are too vague to be good indicators; but we did not spend time trying to sharpen them as soon as we realized that data related to them are not collected and reported consistently, or the indicator was problematic for other reasons.)

- **The amount of healthy food for sale in supermarkets is increasing.** (The data are proprietary and their quality is questionable. Furthermore, people collecting the data define “healthy” in different ways).
- **Healthy food is placed in stores so that it is the most convenient and readily selected alternative.** (No national data on product placement are available, and “healthy” does not have a standard definition among those collecting data.)
- **The amounts of food additives (preservatives, food coloring, etc.) are decreasing.** (The data are proprietary.)
- **The amount of pesticide residues in food is decreasing.** (We decided to consider pesticides as part of the “green” attribute, although we acknowledge concerns associated with pesticide residues on food, particularly related to spotty testing of imported food. For an excellent essay on the status of data on this topic, see Benbrook 2008.)

- **Food assistance venues provide healthy food to all clients.** (The data are not collected at the national level, although Feeding America [previously America's Second Harvest] has limited data. There is no consistent definition of "healthy".)
- **School Wellness policies that include measures to improve food choices are being implemented.** (No national data are available on prevalence and implementation of the School Wellness policies that specifically include food choices.)
- **The number of people growing their own produce is increasing.** (This can be ascertained at the local level partially through food assessments that include community gardens, but we did not consider it to be as strong an indicator of health as other possibilities.)

Fair

Definition: Fair food comes from food systems deliberately organized to promote social equity and justice through food system activities (production, processing, distribution, sales and purchasing, consumption, etc.), and to provide sustainable livelihoods to workers. Dimensions of fair food include working conditions and compensation for farmers; working conditions, compensation and other human rights for food system workers; and discrimination on the basis of gender, color, race, national origin or language.

Additional criteria that we used to focus on the most critical impacts are whether impacts constitute violations of human rights endorsed by international conventions and agreements (the Covenant on Economic, Social and Cultural Rights; International Labor Organization conventions on workers, women and discrimination). Although the US has not signed or ratified the conventions related to labor, women and economic, social and cultural rights that most other countries have signed, we do have clear legal restrictions on discrimination based on race, sex, age, etc. and restrictions on child labor. And as a member of the International Labor Organization and signer of the UN Declaration on Human Rights (which later conventions and agreements have expanded but not fundamentally altered), the US is obligated to comply with basic human rights standards. Based on our criteria, the most critical impacts of fairness in the current US food supply would be:

NATIONAL INDICATORS – FAIRNESS

(See Appendix 2 for Trends):

(1) Farmworkers receive wages sufficient to support a household for full-time work. (Food system activity = production)

Measures: Ratio of average annualized farmworker wage to the US poverty threshold. Sources: Department of Labor, National Agricultural Worker Survey for farmworker wages <http://www.doleta.gov/agworker/naws.cfm> as reported in Kandel (2008); poverty threshold from U.S. Census Bureau <http://www.census.gov/hhes/www/poverty/threshld/thresh07.html>

Explanation: Poverty prevents most farmworkers from enjoying the opportunities for advancement that people in other occupations have, or being able to secure rights that are denied them. The Living Wage Calculator developed as part of the Poverty in America Project at Penn State University (<http://www.livingwage.geog.psu.edu/>) indicates that jobs in the categories of "Farming, Fishing and Forestry" consistently fall below the living wage for one adult living with one child.

Limitations of this measure: The US poverty threshold is not an adequate measure of ability to sustain a household: see Boushey et al. (2001) and Allegretto (2005) for a research update on documentation of the types of hardships that people at 200% of the poverty threshold face, and development of family budget calculators as an alternative measure. The Economic Self-sufficiency Standard (see <http://www.wowonline.org/>)

ourprograms/fess/sss.asp) and livable wage estimates come closer, but those amounts vary tremendously according to local factors; no single national number is adequate. No federal data on livable wages are maintained, although numerous living wage campaigns and organizations have set thresholds by state or city. It is possible to accommodate this shortcoming by using a figure that is 125% or more above the poverty level; we do not do this because we are using the publicly available data as they are reported (and noting their inadequacy as relevant). The total number of agricultural workers is unknown, and the NAWS tries to accommodate that with different sampling weights. Monitoring farmworkers is difficult because of the high proportion who are undocumented, transient and/or do not speak English.

Limitations of this indicator: Farmwork is usually part-time and temporary. It could be argued that expecting livable annual wages from working only part of the year is not reasonable, but in fact farmworkers may not have opportunities to supplement their wages from farmwork with other work. Also, it could be argued that wages from one adult should not be expected to cover household expenses; most households in the US with income above the poverty threshold have two or more working adults contributing to income.

(2) The percentage of farmworkers hired through labor contractors is declining. (Food system activity = production)

Measure: percentage of farmworkers hired through labor contractors. Source: USDA National Agricultural Statistics Service. Farm Labor, August reports. <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1063> See tables: “Agricultural Service Workers: Number, Hours Worked, and Wage Rates for California, Florida, and United States” and “Hired Workers: Annual Average Number and Hours Worked by Region and United States”. The percentage of farmworkers employed through labor contractors is equivalent to the ratio of July agricultural service workers to the sum of July agricultural service workers and hired workers.

Explanation: Labor contracting is one of the most corrupt components of the farm labor system. The use of contractors absolves farm owners from responsibility for working conditions and workers to date have had difficulty holding contractors legally responsible for workplace violations.

Limitations of this measure: Surveys are conducted in October and July to represent different seasons but no annual data are available. The category of agricultural service worker includes all farm contract workers including both low wage farm labor crews and many specialized service providers such as veterinary work who receive much higher wages. Farmworkers are difficult to monitor because of the high proportion who are undocumented, transient and/or do not speak English.

Limitations of this indicator: While labor contracting has the potential to exploit workers, some labor contracts are negotiated and executed fairly. It might be argued that labor contracting per se is not the problem. However, we chose to include this as an indicator because of its significance to farmworkers and organizations working on their behalf: labor contracting allows added “slippage” and lack of transparency in a labor system that already lacks accountability in many ways.

(3) Food system workers have safe, healthy working conditions. (Food system activities = production, processing)

Measures: Reported workplace injuries and illnesses for farmworkers and for food-processing workers. Source: Department of Labor, National Agricultural Workers Survey (see #1 above); Bureau of Labor Statistics <http://www.bls.gov/iif/oshsum.htm#07Summary%20Tables>

Explanation: Food system workers (e.g., people who work in food-processing plants, packing plants, fast-food restaurants and food retail) generally have higher hourly wages than fieldworkers, although annualized wages still tend to be below the poverty threshold (see Anderson, 2008). Violations of workplace safety regulations are common in food production and processing, and means of recourse often do not exist or are inadequate.

Limitations of this measure: Deaths and hospitalization due to pesticide exposure and injuries to farmworkers, food system workers and their family members are seriously under-reported in all national data sets (see Committee on Education & Labor, 2008). The most recent data on occupational injuries and illnesses are 2 years old, and may not include farmworker injuries incurred during travel to worksites. Trends are difficult to interpret because changes in methodology in 2004 led to a 50% reduction in reported injuries. Injuries to workers on farms with less than 10 employees are not reported. Employers classify injuries, and may not do so correctly. In addition, farmworkers and food processing workers are difficult to monitor because of the high proportion who are undocumented, do not speak English, migrate seasonally, or lack access to health care.

Limitations of this indicator: Workers face different challenges and rights abuses in each food system activity (production, processing, packing, etc.). Injuries are probably most relevant for farmworkers (because of pesticide exposure in fields and heat exhaustion) and food-processing workers (because of proximity to knives and dangerous equipment in their work). However, an increase reporting injuries may actually be a sign of progress, since some farmworkers and food processing workers do not have access to healthcare, are very reluctant to report injuries, or cannot get to hospitals when they are injured. In addition, injury is only one part of a much wider spectrum of workers' rights abuses, including being forced to work overtime without pay, being denied breaks, and discouragement of unions or organizing. Health problems can affect more than just the worker because family members including children and pregnant women who live on or close to agricultural land are exposed to agricultural chemicals. The effects of pesticide exposure and musculoskeletal injury are often difficult to study: they may be cumulative, long-term and difficult to attribute precisely to exposure during a given time period.

(4) Average net farm income of small and mid-scale family farms matches or exceeds median national household income. (Food system activity = production)

Measure: Net farm income of farming-occupation small family farms (low-sales and high sales). Source: Agricultural Resource Management Survey 2007 (conducted in June 2008)

Explanation: In most recent years, only the largest-scale farmers in the US earned sufficient income from farming to support a household, without subsidies from off-farm employment or government payments. Government subsidies and other forms of support have privileged large-scale farms for several decades, even though they are a small fraction of total farms. In part because of this, farmland has become increasingly concentrated into large and very large farms, even though small family farms (<\$250,000 in annual sales) made up 90% of all farms and held about 68% of farm assets as of 2004 (Hoppe et al., 2007). Large and very large farms are usually under family ownership as well, but management at this scale tends to replace family labor and knowledge inputs with machinery, synthetic chemicals and hired labor. Net farm income depends on complex interlocking factors beyond farmers' control, such as the value of the dollar, international demand, and weather. These factors can vary more rapidly than farm production decisions, leaving farmers to absorb the risk.

Limitations of this measure: USDA's farm typology combines many different farm types that operate under different constraints. It uses gross sales categories to distinguish farm types (low-sales = <\$100,000 and medium-sales = \$100-299,000 for farms whose operators report farming as their major occupation). Minority farms and farmers tend to be undercounted.

Limitations of this indicator: This measure combines farms using all kinds of farming practices and growing all kinds of crops. Some farming practices contribute to environmental degradation, and some crops contribute to an over-supply of relatively unhealthy food; therefore, rising net farm income for farmers at this scale does not necessarily mean that the food supply is becoming greener or healthier. Net farm income includes government subsidies, and farmers cannot rely on this source of income continuing indefinitely. Many farm operations that are profitable with subsidies would not be profitable without, so this measure may give an unrealistically rosy picture of the economic viability of farms

(5) Acreage of mid-scale family farms is holding stable. (Food system activity = production)

Measure: Number of farms and acreage in “Farming occupation-high sales categories. Source: Agricultural Resource Management Survey <http://www.ers.usda.gov/Data/ARMS/>

Explanation: Concentration of land into larger farms has accompanied the decline in net farm income for smaller family farms and price volatility for crops. This indicator tracks the number and total acreage of land in mid-scale farms. These farms are important to regional food systems because they can grow enough to supply institutional buyers. Often they are too large to make direct marketing feasible; but this strategy has helped smaller farms to thrive. The loss of mid-scale family farms is associated with the decline of agricultural communities and number of farmers, described at <http://www.agofthemiddle.org>.

Limitations of this measure: USDA’s farm typology combines many different farm types that operate under different constraints. It uses gross sales categories to distinguish farm types (low-sales = <\$100,000 and medium-sales = \$100-249,000 for farms whose operators report farming as their major occupation). Minority farms and farmers tend to be undercounted.

Limitations of this indicator: This indicator combines farms using all kinds of farming practices and growing all kinds of crops. Some farming practices contribute to environmental degradation, and some crops contribute to an over-supply of relatively unhealthy food; therefore, rising average income for farmers at this scale does not necessarily mean that the food supply is becoming greener or healthier. Farms are categorized by sales, so this indicator doesn’t precisely track the viability of mid-scale farms. Depending on sales and prices in a given year, a farm might shift from one category to another.

(6) Farmers retain a consistent proportion of the food dollar. (Food system activities = production, processing, distribution, sales)

Measure: Farm share of the marketing bill. Source: Price Spreads from Farm to Consumer: Marketing Bill. Economic Research Service. <http://www.ers.usda.gov/data/FarmToConsumer/marketingbill.htm>

Explanation: Farmers’ declining ability to retain a sizable proportion of the food dollar reflects their declining market power vis-à-vis other food system actors.

Limitations of this measure: ERS has revised some of the historical data, and categories in the marketing bill combine a large number of factors, hiding trends in them which may be significant to fairness of the food system.

Limitations of this indicator: This indicator combines farms using all kinds of farming practices and growing all kinds of crops. Some farming practices contribute to environmental degradation, and some crops contribute to an over-supply of relatively unhealthy food; therefore, simply because farmers receive a stable proportion of the food dollar does not necessarily mean that the food supply is becoming greener, healthier or more affordable. Increasing shares of the food dollar going to other food system activities after production can result from changes in a number of factors, including marketing costs, the quantity of marketing services (for example, the amount of processing by food manufacturers), or the product mix that farmers grow.

FAIRNESS HOT SPOTS

(See Appendix 2 for Trends):

(1) Number of child fieldworkers. Source: Human Rights Watch (2002)

(2) Discrepancy in cancer rates and neurological disorders between farmworkers and other occupational groups. Sources: Mills and Kwong (2001); Rothlein et al. (2006)

(3) Pesticide exposure in farmworkers' children. Sources: Eskenazi et al. (2007); Arcury et al. (2007)

(4) Concentration of market held by top companies within a sector (CR) Sources: Packers & Stockyards Statistical Report <http://www.gipsa.uda.gov/> ; Hendrickson and Heffernan (2007)

(5) Long-term decline in the amount of farmland operated by minorities relative to declines in farmland operated by whites. Source: US Agricultural Census

Notes: Child labor is a clear violation of international labor regulations, but US regulations on child labor in fieldwork are more lenient than in any other occupation. The numbers of children employed in agriculture are very difficult to measure, and estimates range widely.

Harmful effects of pesticide exposure and poor work conditions may be chronic (and therefore not apparent at the time of exposure), and may extend to family members. Cancer rates and neurological disorders are examples of effects of chronic exposure; the occurrence of pesticide metabolites in children's bodies demonstrates that they are being exposed to pesticides even when they are not in the fields.

Excess market concentration is a sign of non-competitive markets. CR4 measures compiled by Henderson and Heffernan and reported in GIPSA Statistical Reports indicate restricted competition if above approximately 30; these measures depict changing power relations in agriculture with the largest businesses (usually vertically integrated over several food system activities) capturing more food system profits. We include them here rather than as National Indicators because the data about market share held by specific companies is difficult to track; and the identity of the companies is often complex because of mergers and acquisitions. Data on market share held by individual companies has become less available over the past decade.

Long-term land loss by minorities has been strongly influenced by inability to access credit and farm services that are available to whites. Even where discrimination has diminished over the past generation, its legacy has lasting impacts. Therefore, although the 2002 and 2007 Agricultural Censuses showed increases in minority farmers, the impacts of earlier patterns of severe discrimination still affect the face of farming and farm communities. We include this as a Hot Spot rather than a national indicator because the national data quality on minority farmers and land-owners is poor. In addition, the trend of greater farm loss by minorities is confounded by African Americans who were eager to get away from farming after slavery and the Reconstruction era.

OTHER FAIRNESS INDICATORS CONSIDERED BUT NOT INCLUDED:

- **Percentages of farmworkers, food-processing workers, fast-food restaurant workers or food retail workers who belong to unions are increasing.** (National data are not available or reliable. We also rejected this indicator because it is weak: although the right to collective bargaining and participation in unions is denied many workers in the food system, simply being part of a union does not necessarily mean that workers will achieve better rights.)
- **Farmworkers are included in the National Labor Relations Act.** (Overturning the exemption of farmworkers from the NLRA would give them a legal basis for action against rights violations, but actually improving conditions and wages for food system workers will require many intermediate steps.)
- **The numbers of farmworkers covered by fair and equitable immigration policy, including adequate opportunities for work visas and policies that recognize workers' basic rights, is increasing.** (Immigration policy is in serious need of revision, and meanwhile large numbers of farmworkers suffer material and emotional harm from harsh policies and the ways they are enforced. Farmers are hurt as well, by restricted access to labor. Given that clear and fair policies do not exist at present, an indicator cannot be constructed.)
- **The proportions of farmers and farmworkers who have fair contracts are increasing.** (No national data available. Rural Advancement Foundation International-USA has attempted to set standards for fair farmer contracts at <http://www.rafiusa.org/programs/contractag/contrag.html>.)
- **Conditions promoting fairness for independent retailers, processors and other food businesses are improving.** (No national data are available.)
- **Public policy initiatives to promote better working conditions and wages for food system workers are increasing in number and efficacy.** (No compiled national data are available.)
- **Community economic impacts of production agriculture are positive and growing.** (No national data are available.)
- **Agricultural pollution does not have disproportionate effects on any group of people distinguished by race, color, class, income, educational level or other characteristics.** (No national data are available.)
- **All farmers have fair access to markets and services such as credit and information.** (No national data are available, although anecdotal evidence and existing data sets indicate severe discrimination due to race and other factors and to vertical integration.)
- **Net income for farmers using environmentally sound production methods that protect the public domain is rising.** (No national data differentiating farmers by their production methods are available.)
- **Farmers receive market prices consistently above costs of production.** (This index does not account for increases in productivity or rising land prices. It also lumps together all types of farmers, including those whose practices cause serious environmental or social harm.)
- **All consumers have fair access to high-quality foods, regardless of race, color or other factors** (i.e., the cost of high-quality food is the same in neighborhoods populated mainly by people of color and white neighborhoods; no national data are available).
- **The percentage (or volume or total sales) of Fair Trade labeled goods in the US marketplace is increasing.** (No public-access, consistent

data are available on the volume or value of food sold as Fair Trade certified in the US. Several trade publications monitor these trends; <http://www.marketresearch.com> lists publications, prices and links to ordering sites. The most recent US report was by Datamonitor in February, 2008: *The Next Step in the Ethical Consumerism Market* (42 pages, \$2795). It reported that the US market for fair-trade goods is \$850 million [Drinks-Business-Review.com, 2008]. Questions have been raised about the consistent enforcement of Fair Trade standards in developing countries.)

- **Small-scale producers are not disproportionately disadvantaged by food safety regulations.** (This issue is important and may become a hot spot, with growing efforts to regulate farms to ensure food safety. Data are not collected consistently to document impacts, however.)

Green

Definition: “Green” food comes from food systems that entail minimal harm to the environment. Dimensions of “greenness” are impacts on water quantity and quality, farmland quality and preservation, biodiversity, fossil fuel supply, and climate change. Additional criteria that we used to focus among possible indicators that meet this definition and our general criteria for indicators were whether they show if:

- non-renewable resources in the food system (including genetic resources) are being mined,
- essential renewable resources are being used up or degraded more rapidly than they can be regenerated, and
- waste is being produced in excess of the planet’s capacity to absorb it without environmental harm.

Based on our criteria, the most critical impacts of a green food supply would be:

NATIONAL INDICATORS - ENVIRONMENTAL QUALITY

(See Appendix 3 for Trends):

(1) **Farmland is remaining in production.** (Food system activity = production)

Measure: Land in farms. Source: US Agricultural Census. <http://www.agcensus.usda.gov/index.asp> (2002 last year for complete posted data)

Explanation: Farmland lost to development tends not to revert to farmland, and restoration of degraded land is expensive and time-consuming. Keeping current farmland in production prevents the destruction of natural habitat.

Limitations of this measure: The Agricultural Census is conducted only every five years, and data are not available until a few years after the year of the survey. Other limitations of the Agricultural Census are described in C-FARE (2007). While the objective with this indicator is to track land that remains as productive farmland, this measure only gives the total area; so development of farmland might not be apparent if new land (or land that has reverted to good wildlife habitat) is being put into production at an equal pace.

Limitations of this indicator: Land remaining in production may be farmed with unsustainable practices that do not meet our rationale above. Some people argue that increasing the intensity of agricultural production is necessary to meet global food demands; so they might prefer to see farmland going out of production, especially if it were restored to some approximation of natural habitat. Our indicator is premised on the assumption that improving the environmental impacts of farming practices on existing farmland is more critical to long-term sustainability than

increasing the intensity of production because many techniques for increasing intensity have undesirable environmental or social impacts.

(2) Soil quality is improving. (Activity = production)

Measure: Total soil erosion from wind and water. Source: USDA National Resources Conservation Service, National Resources Inventory <http://www.nrcs.usda.gov/TECHNICAL/NRI/2003/nri03eros-mrb.html>

Explanation: Healthy soil is the foundation of crop production. For all practical purposes, it is a nonrenewable resource because natural rates of soil generation tend to be very low. Erosion strips the topsoil first, which is the source of most soil nutrients and soil biota. While erosion is not the way that soil quality is degraded, it is considered to be the primary impact. About 60% of total soil erosion comes from agriculture (OECD, 2008).

Limitations of this measure: Erosion data are collected annually now, but were collected only at five-year intervals until 1997. The latest publicly available data are from 2003. Data are not always reducible to state and regional levels with validity.

Limitations of this indicator: Soil quality and productivity may be degraded even if there is no erosion, for example through overgrazing, salinization, compaction or contamination. Other forms of soil degradation are not tracked as well as erosion in federal data. Soil fertility trends in particular are not tracked consistently.

(3) Water contamination by pesticides in agricultural areas is declining. (Activity = production)

Measures: USGS National Water-Quality Assessment Program <http://water.usgs.gov/nawqa/> data, as reported in Chapter 3 (Water) of US EPA Report on the Environment (2008a). <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=190806>, showing the percentage of stream sites in 36 representative agricultural watersheds in which at least one pesticide exceeds benchmarks for aquatic health. These data are also reported in Gilliom (2007).

Explanation: Pesticide hazards from excessive or inappropriate application include acute, immediate toxicity to humans and other non-target organisms and chronic or long-term toxicity such as cancer, reproductive and neurological effects. About 80% of total US pesticide applications are in agriculture.

Limitations of this measure: The most recent pesticide data in the public domain are from 1992-2001 and only one full sampling cycle has been conducted by NAWQA, but we include it as a National Indicator because the Environmental Protection Agency plans to begin annual reporting (see http://www.epa.gov/ocfo/plan/2006/goal_4.pdf). Sampling for all possible pesticides is prohibitively expensive; even basic water sampling for a few pesticides with a statistically sound experimental design is expensive. Current (real-time) data are not available at the national level, and much of the toxicity data on individual pesticides is missing. While the sampling sites were selected to be representative, they may not accurately reflect the distribution of pesticide concentrations in all US agricultural watersheds. Aquatic life benchmarks do not exist for 21 of the 83 pesticides and pesticide degradation products that were analyzed, and current standards and guidelines do not account for mixtures of chemicals and seasonal pulses.

Limitations of this indicator: Some pesticides are relatively non-toxic. This indicator does not accommodate the benefits of pesticides to increase yields (i.e., there is no cost-benefit analysis). The indicator does not provide information on the magnitude of pesticide concentrations, only whether they exceed or fall below benchmarks.

(4) The nitrogen balance of US farming systems is declining. (Activity = production)

Measures: Nitrogen balance in the US, in Chapter 1, Section 1.2 (Nutrients) of OECD (2008).

Explanation: The nitrogen balance is the difference between the quantities of nitrogen entering a farming system (as fertilizer, manure, etc.) and leaving the system (as crops, run-off and leaching, ammonia volatilization, etc.). It indicates the potential for nitrogen pollution and the nitrogen recycling efficiency of farming systems. Nitrogen surpluses lead to eutrophication of surface and coastal waters, which kills aquatic species. They also degrade the quality of drinking water in groundwater wells and contribute to global warming through methane, ammonia, and nitrous oxide emissions.

Limitations of this measure: Nitrogen balance calculations involve assumptions and uncertainties related to nutrient conversion coefficients and nutrient uptake by pasture and crops. These are influenced by drought, flood, temperature, plant and varietal mix, and soil types. OECD (2008) only reports the nitrogen balance between 1990-92 and 2002-2004. Although this is a public data source, it is not available on-line for free.

Limitations of this indicator: The nitrogen balance does not show the impacts of excess nitrogen, just the potential for impacts.

(5) Agricultural production emits declining amounts of greenhouse gases. (Activity = production)

Measures: annual statistics on CO₂, methane and nitrous oxide emissions from agricultural production. Source: USEPA (2008a) shows emissions from agricultural production 1990-2006.

Explanation: Food systems are estimated to contribute about 17% of total greenhouse gas (GHG) emissions, causing global warming with potentially catastrophic consequences for food systems and other ecosystem services.

Limitations of this measure: Data more recent than 2006 are not available on-line.

Limitations of this indicator: Agricultural production is only part of the food system and other food system activities emit GHG as well. National data on GHG emissions of other food system activities are limited. Agriculture also sequesters some carbon (see http://www.epa.gov/sequestration/sequestration_rates.html for estimates of amounts through 2002). Net GHG from food systems would be a more useful indicator, but data are not available. Data on carbon sequestration in agricultural soils are available in the EPA's "Inventory of US greenhouse gas emissions and sinks: 1990-2006" (EPA 2008a); but we decided that insufficient information is available about the data to calculate net emissions.

ENVIRONMENTAL QUALITY HOT SPOTS

(See Appendix 3 for Trends):

(1) Growth of the Dead Zone in the Gulf of Mexico. Source: National Oceanic and Atmospheric Administration, <http://www.gulphypoxia.net/research/shelfwidecruises/2008/PressRelease08.pdf>

(2) Pharmaceutical, hormone and other organic contamination of fresh water from livestock facilities. Sources: Hanselman et al. (2003), Khanal et al. (2006)

(3) Average number of calories from food system activities required to provide one calorie of food. Source: Smil (2008)

(4) Population trends of farmland birds. Sources: OECD (2008); North American Breeding Bird Survey <http://www.pwrc.usgs.gov/BBS/>

Notes: All major US rivers have hypoxic zones (Dead Zones) at their mouths, due to nutrient run-off. The Mississippi carries the largest nutrient load, and most of it comes from agricultural land in the Midwest.

Freshwater contamination by pharmaceuticals, hormones and other products administered to livestock, particularly in confined animal feeding operations, is a serious concern because of its impacts on both human health and the health of aquatic organisms.

The energy-in to energy-out ratio shows that current food system activities require much more energy than they provide, thus requiring steady subsidies from other energy sources. As long as the other energy sources are non-renewable, this is an unsustainable proposition. However, the calculation is based on a number of assumptions and has not been updated recently; Smil warns against non-critical use of these data since life-cycle analysis reveals that other parts of supply chains use much more energy than production.

Agricultural intensification and the conversion of land to agriculture have tremendous impacts on biodiversity, but the data is not available in a usable form in the US. OECD's agri-environmental indicators include data on population trends of farmland birds, which are good indicator species of other biodiversity issues. All OECD countries show declining farmland bird populations. However, US data are not included (European data come from the Pan-European Common Bird Monitoring Scheme, and Canadian Wildlife Service supplies Canada data). The North American Breeding Bird Survey is a cooperative effort between US Geological Survey and the Canadian Wildlife Service to monitor the status and trends of about 400 birds, but the data are displayed only by species, state and region. Therefore, knowledge of which bird species are most vulnerable to agricultural encroachment, chemicals or other practices is necessary in order to use the data to determine likely effects of agriculture.

OTHER ENVIRONMENTAL INDICATORS CONSIDERED BUT NOT INCLUDED:

- **Groundwater is being recharged at rates above depletion rates.** (Annual national aquifer depletion rates are not reported.)
- **Irrigation water use efficiency is increasing more quickly than freshwater sources for irrigation are being degraded or depleted.** (The latest edition of Agricultural Resources & Environmental Indicators has data on adoption of water-conserving irrigation technology, such as the practices shown in Table 4.6.3. that compare 1988 and 2003. This is not connected with aquifer depletion or water degradation however.)
- **The US phosphorus balance is declining.** (US phosphorus surpluses are not as much of a problem as nitrogen surpluses. Compared with other OECD countries, US phosphorus balances are small.)
- **Crop biodiversity** (number of species grown and number of varieties within species) **and livestock diversity** (number of breeds raised) are increasing. (Data are not available for the US, although this is reported for other countries in the Organization of Economic Cooperation and Development in OECD, 2008.)
- **Accessions of agricultural species to gene banks are increasing.** (The US has superior gene banks, but in this project we were more interested in in situ conservation of biodiversity on working lands.)
- **Biodiversity in non-farmed areas within farms and in natural areas adjacent to farms is increasing.** (No national data are available.)
- **Connectivity of non-farmed areas within farms and natural areas adjacent to farms is increasing.** (No national data are available about the

extent of these areas, much less their connectivity in ways that would enhance wildlife populations.)

- **Population numbers and health of wild species that perform critical agroecosystem services (pollination, predation, nutrient cycling, etc.) are increasing.** (No data are available.)
- **Use of polycultures and crop rotations is increasing.** (No national data are available on polycultures, or the contributions of crop rotations to biodiversity.)
- **Populations of non-native invasive species in farmed areas are declining.** (National data are not adequate to determine population sizes and extent of land affected.)
- **Pesticide use is declining.** (Pesticide use is monitored and reported in the US, although comprehensive data have not been collected for the last two years. According to OECD, pesticide use in the US declined between 1990 and 2003 by 4% despite a 13% rise in crop production over the same time period. Pesticide use data do not account for the toxicity of pesticides, changes in crop production, or changes in land use. They tell us little about reductions in pesticide risk, although there is a correlation between reduced pesticide use and pesticide risk in countries that report pesticide risk indicators [OECD, 2008].)
- **The use of biological controls rather than highly toxic pesticides is increasing.** (No national database tracks the replacement of pesticides with biological controls.)
- **The amount of land covered by effective, comprehensive conservation plans is increasing.** (We considered this to be a relatively weak indicator.)
- **The total number of farmers using independently certified eco-labels is increasing.** (Consumers' Union lists independently certified eco-labels on the GreenerChoices Eco-labels website <http://www.greenerchoices.org/eco-labels/eco-home.cfm>, and websites of some certifying programs list the number of participating farmers. Participation in a certification program does not necessarily mean that farms are using all possible means to reduce harmful environmental impacts. Specific environmental standards vary across eco-labels.)
- **Fossil fuel use in food systems is declining.** (The International Energy Agency tracks direct on-farm energy consumption by primary agriculture, but does not distinguish between use of renewable and non-renewable energy sources.)
- **Use of renewable energy on farms is increasing.** (No national data are available.)
- **Of the total energy required to obtain food, the percentage from renewable sources is increasing.** (No national data are available.)
- **Net food system contributions to greenhouse gas emissions are declining.** (No national data are available that encompass the entire food system; EPA data divides different sectors of the food system so that the net contributions cannot be easily determined.)
- **The amount of food packaging for cosmetic purposes is decreasing, and packaging materials are increasingly biodegradable.** (No national data are available.)
- **The proportion of meat sold in the US that is grass-fed and not raised in confined animal feeding operations is increasing.** (No national data are available.)
- **The production of food from urban agriculture is increasing.** (No national data are available.)

Affordable

Definition: Affordable food comes from food systems in which all people and households can obtain healthy diets, either by buying the food with household income, using subsidies to offset the cost, or other socially acceptable ways. In most prevalent conceptualizations of food security, affordability is a dimension of accessibility. In the absence of “accessibility” as a core attribute of good food, we extended the definition of affordability to cover food access. Therefore, the dimensions of affordable food are access to healthy food and food security. Price often is a poor indicator of affordability and access, as is demonstrated in other industrialized countries in which customers pay a higher percentage of their income for food yet have better food security and health indicators than the US. This is because of the complexity of factors affecting food access, and the relativity of food price to other household expenses.

An additional criterion that we used to select the most critical impacts of the current US food supply on affordability is whether the impact reveals if people can access a healthy diet without foregoing other essential household goods and services. Based on these criteria the most critical impacts of an affordable US food supply would be:

NATIONAL INDICATORS – AFFORDABILITY (SEE APPENDIX 4 FOR TRENDS):

(1) The prevalence of household food security is increasing. (Food system activity = consumption)

Measure: percentage of population that is food secure. Source: Current Population Survey, reported by Economic Research Service of USDA <http://www.ers.usda.gov/Briefing/FoodSecurity/>

Explanation: If food were affordable we would expect to find little food insecurity because food in the US generally is available (although with some exceptions, such as in rural or urban areas without retail markets) and accessible (although with some exceptions, such as when transportation options are limited).

Limitations of this measure: These data are not available at sub-state levels, so drilling down to specific regions is not possible.

Limitations of this indicator: When food is not available or accessible, food security is not as highly correlated with affordability.

2) The prevalence of child food security is increasing. (Activity = consumption)

Measure: percentage of children ages 0-17 that is food secure. Source: Current Population Survey, reported by Economic Research Service of USDA <http://www.ers.usda.gov/Briefing/FoodSecurity/>

Explanation: Child food security tends to be higher than overall household food security because adults will forego meals to make sure that children eat (Nord 2003). We highlight child food insecurity in addition to household food insecurity because its impacts and solutions are different. It is especially insidious because it leads to poor school performance and perpetuation of the conditions later in life that created food insecurity for the child.

Limitations of this measure: These data are not available at sub-state levels, so drilling down to specific regions is not possible. They rely on household self-reporting with associated error.

Limitations of this indicator: When food is not available or accessible, child food security is not as highly correlated with affordability.

3) Increases in wages and salaries are equal to or greater than increases in food prices. (Activity = consumption)

Measure: percentage change in the food section of the Consumer Price Index relative to percentage change in average wages over the past 12 months. Sources: increase in price of food from Bureau of Labor Statistics, Consumer Price Index Detailed Report Tables (CPI-U), http://www.bls.gov/cpi/cpi_dr.htm#2009. Historical data http://www.bls.gov/schedule/archives/cpi_nr.htm#1999. Increase in average wages and salaries from Bureau of Labor Statistics, Employment Cost Index from the National Compensation Survey <http://data.bls.gov/cgi-bin/surveymost?bls>. Historical data (1999 and earlier) from Employment Cost Indexes, 1975-99 <http://www.bls.gov/ncs/ect/sp/ecbl0014.pdf>

Explanation: Households that are not in poverty can become food insecure easily if food costs rise too rapidly to allow them to budget for food expenditures, or if the cost of other necessities precludes being able to buy food. The Employment Cost Index allows tracking the percentage increase in the total value of wages, salaries and benefits.

Limitations of this measure: The Consumer Price Index only tracks urban consumers. These data are reported regionally, but state and sub-state data are not available. The CPI only tracks the aggregate measures, so we do not know the percentage of households for which wages and salaries are keeping up with or exceeding food prices. The Bureau of Labor Standards has at least eight statistical programs providing information on worker pay, and other government and private sources also collect compensation information. Although the ECI seemed most useful for our purposes because it is not influenced by employment shifts across occupations and industries, it excludes government workers, agriculture, private households, and people who can set their own compensation (such as self-employed business owners).

Limitations of this indicator: Food becomes relatively less affordable as any other household expenses rise. So even if wage increases keep up with food price increases, food may not be affordable within the constraints of the household budget.

AFFORDABILITY HOT SPOTS

(See Appendix 4 for Trends):

(1) Adequacy of maximum food stamp levels to provide households with a healthy diet, according to current dietary guidelines. Source: Real Cost of a Healthy Diet Project, Children's HealthWatch <http://www.c-snap.org/page.php?id=23> Also see Carlson et al. (2007).

(2) Relative cost per calorie of nutrient-dense and calorie-dense foods. Source: Monsivais and Drewnowski (2007).

(3) Increase in costs of healthy staples. Source: Carlson et al. (2007).

(4) Rural and urban communities where adequate supplies of healthy food are not available (commonly called "food deserts"). Sources: <http://marigallagher.com/projects/> for analyses of links between urban food deserts and health outcomes; California Center for Public Health Advocacy, PolicyLink, and the UCLA Center for Health Policy Research (2008) for description of the Retail Food Environment Index and its link to health; Morton and Blanchard (2007) for information on rural food deserts

Notes: Research has shown that low-income families in major urban areas cannot buy the Thrifty Food Plan with maximum food stamp benefits, much less afford a food plan that reflects current dietary guidelines (e.g., includes whole-grain bread and pasta and adequate amounts of fruits and vegetables).

Calorie dense foods tend to be much cheaper per calorie than nutrient-dense foods, and the cost of healthy staples has been increasing more rapidly than the cost of less healthy options.

OTHER AFFORDABILITY INDICATORS CONSIDERED BUT NOT INCLUDED:

- **Healthy food is less expensive than non-healthy food with low nutrient density.** (National data on healthy food sales and cost are proprietary and there are no consistent definitions of “healthy”. We included a related indicator in “Hot Spots”)
- **Cost per unit of nutrient density is remaining steady or declining.** (We rejected this indicator because we emphasize whole, minimally processed foods as part of our approach to health rather than considering foods as bundles of nutrients. This indicator could give higher marks to nutrient-fortified junk food than to whole foods that are better components of a healthy diet.)
- **A growing proportion of those eligible for food assistance are receiving services.** (Access to food assistance programs is related to food security, but not a direct indicator of affordability.)
- **The percentage of children served by Universal Free Breakfast and Free Lunch Programs is increasing.** (Universal Free Breakfast and Lunch Programs remove the stigma often attached to reduced-price programs, but data on the percentage of children served are not available.)
- **Average wages cover the full cost of food with all social, environmental and economic externalities internalized.** (Life-cycle analysis of food products provides useful information, but the methods are not simple and methods to address social externalities are still under development.)
- **The number of people affected by food deserts is declining.** (Accessibility and affordability are related but not equivalent.)
- **The number of initiatives to develop full-service retail markets in low-income neighborhoods and food deserts is increasing.** (Accessibility and affordability are related but not equivalent.)
- **The number of transportation initiatives to increase accessibility of supermarkets to low-income citizens is increasing.** (Accessibility and affordability are related but not equivalent.)

PROMISING INNOVATIONS FOR GOOD FOOD

The National Indicators that we selected deal with areas relevant to the attributes of good food that have the best national, publicly-available data. Hot Spots are places and conditions needing urgent attention from decision makers, even if comprehensive data is not yet available. But these two sets of indicators give a partial picture of the state of good food in the US: many positive changes are happening, that are not necessarily reflected in the National Indicators. This section highlights some of these changes that point toward a healthier, fairer, greener and more affordable food supply. In many cases, a promising innovation has impacts or potential impacts on more than one good food attribute, but we have grouped them below according to the area in which we see the most positive impacts.

PROMISING INNOVATIONS - HEALTH

(1) Direct farmer-to-consumer sales are growing in value. (Activities = production, distribution, sales, consumption)

Measure: Value of agricultural products sold directly to individuals for human consumption. Source: US Agricultural Census <http://www.agcensus.usda.gov/index.asp>

Explanation: Direct sales are usually whole and minimally processed foods that provide essential nutrients to the diet and do not cause diet-related disease under normal circumstances (part of our definition of healthy food). Of total direct sales, a relatively large proportion is fruits and vegetables. Direct sales have other benefits related to the “fair” and “green” attributes as well (e.g., farmers retain more of the revenue than through other marketing mechanisms, and greenhouse gas emissions may be lower because of less packaging and refrigeration. They also may improve community health by keeping more money in a local economy.

Limitations of this measure: The Agricultural Census is conducted only every five years, and data are not available until a few years after the year of the survey. Although a survey was conducted in 2007, national data on 2007 direct sales are not yet publicly available. The Census probably does not capture all sales, and farmers have some incentive to under-report direct sales if participating in a farmers’ market in which they must pay a proportion of total sales to the market. The Census has consistently undercounted minority farmers, and other limitations are described in C-FARE (2007). Direct sales do not translate directly into food consumption.

Limitations of this indicator: Direct sales require extra effort on the part of farmers, and they are not a viable option for many mid-scale and large-scale farms. While foods available for direct sale tend to be healthy, this is not always the case: many farms sell high-fat and sweetened baked goods with white flour, jellies, jams, etc. Buying direct from farmers usually requires customers to seek out less-convenient markets, and may lead to extra greenhouse gas emissions if customers travel longer distances in single-occupant cars to buy directly than they would if buying from other markets.

(2) The number of farm-to-school programs that bring fresh local foods from farms to school cafeterias is growing. (Activities = production, distribution, sales, consumption)

Measure: Number of farm-to-school programs. Sources: National Farm to School Program, Center for Food and Justice, Occidental College, and Community Food Security Coalition. <http://www.farmtoschool.org>

Explanation: Farm-to-school programs help provide needed income to farmers and supplement school meals with fresh, local produce. In addition, farm-to-school programs often have opportunities for children to learn about farms, food production and the food system.

Limitations of this measure: Data collection relies on self-reporting, and the number of programs provides no information on number of children benefiting. Presence of a farm-to-school program does not say anything directly about consumption of healthier foods by children.

Limitations of this indicator: Farm-to-school programs provide only a small portion of the food consumed in schools, and they may not be appropriate for all farmers or all healthy foods. Also, programs vary tremendously and so do the impacts. Other farm-to-institution programs exist, such as farm-to-hospital and farm-to-daycare; national data do not exist however.

(3) Public policy promotes substitution of healthier foods into diets. (Activity = consumption)

Measure: Number of successful state initiatives to improve quality of foods available to children in schools. Source: National Conference of State Legislatures “State Legislation on Childhood Obesity Options 2007”. <http://www.ncsl.org/programs/health/ChildhoodObesity-2007.htm>. Also see the Centers for Disease Control Steps Program for examples of local and community initiatives: http://www.cdc.gov/steps/success_stories/index.htm.

Explanation: Public policy initiatives promoted by citizen action are encouraging indicators that the US public is concerned about diet-related health problems and willing to take action. There is strong interest in creating regulations at the state and local level to improve the likelihood that children, in particular, will make healthy food choices.

Limitations of this measure: This measure is an excellent compilation of public policy initiatives that are gaining momentum, but may be incomplete.

Limitations of this indicator: Regulations designed to promote healthier food choices are relatively new and vary greatly from state to state, although the federal regulatory framework to promote food safety has been in place for almost a century. It is not yet clear how successful they are in actually changing behavior, nor which regulations are most critical to improve health outcomes. Furthermore, the impacts of regulation depend entirely on their implementation and monitoring, which are also likely to vary considerably from state to state.

PROMISING INNOVATIONS – FAIRNESS

(1) The number of US farmers certified under independent (third-party) programs including labor standards to protect workers’ rights is increasing. (Activity = production)

Measures: Agricultural Justice Project pilot certified producers. Source: <http://www.agriculturaljusticeproject.org/pilot.html> ; Food Alliance certified producers. Source: http://www.foodalliance.org/information-for/for-processors-distributors/certified_search

Explanation: Since US law regarding workers’ rights is very lenient, farm or farmer certification of adherence to labor standards that are stricter than US regulations is the only guarantee at present that workers’ rights are respected and protected. Consumer-oriented labels that guarantee fair prices, terms and labor conditions have been in the US marketplace for imported goods such as coffee and sugar for some time. Similar labels for domestically produced goods are beginning to appear, although at a very small scale.

Limitations of this measure: These websites are managed by the organizations that set up the programs and administer the certification.

Limitations of this indicator: Only two US programs at present include labor standards and have independent 3rd-party certification, but at least one other program is under development (SCS-001) and there are several comparable programs in other countries. The number of US producers who are certified under these two programs is minuscule in relation to the total number of farmers in the country. The AJP has a small number of pilot US producers in the Upper Midwest, and Food Alliance farmers are primarily from the Pacific Northwest and Great Plains. Certification is only as good as its enforcement and the specific standards to which farmers are accountable, however. This is added enforcement on top of the current minimal enforcement of labor law that applies to both employers and labor contractors. US customers must find out on their own what each label means, whether it includes labor standards, and whether producers are independently certified. This reduces the scope and effectiveness of these programs, because products are only available if consumers or retail purchasers trust the standards and certification and are pro-active in seeking them out. While the demand for products certified to match consumers' interest in fairness (and environmental quality, animal welfare, and other attributes) is rising, such products remain a small fraction of overall food sales.

PROMISING INNOVATIONS - ENVIRONMENTAL QUALITY

(1) The amount of land under Integrated Pest Management (IPM) is increasing. (Activity = production)

Measure: Agricultural Resource Management Survey, reported by Economic Research Service. Source: Most recent figures published by ERS are in Fernandez-Cornejo and Jans (1999).

Explanation: Integrated Pest Management is designed to improve environmental impacts, using natural and ecological practices, and optimize economic benefits of pesticide use, using them only when necessary.

Limitations of this measure: A complete, practical, and accepted method to measure overall IPM adoption is not yet available. ARMS data on IPM adoption is only available to researchers on request, and it only covers major commodity crops and a few specialty crops. The ERS report is almost ten years old.

Limitations of this indicator: Integrated Pest Management improves environmental impacts, but does not always lead to use of the most sustainable practices following the rationale for "green" in our description.

(2) The amount of land under organic production is increasing. (Activity = production)

Measure: amount of land under organic production. Source: USDA <http://www.ers.usda.gov/Data/Organic/#statedata>

Explanation: Organic production is generally oriented to protecting and enhancing environmental quality, and certification allows tracking of the amount of land under organic production. Organic production practices emphasize building healthy soil, which is especially important to increase carbon sequestration.

Limitations of this measure: US data on organic acreage has only been collected since 1992, and does not include land under organic practices that is not certified.

Limitations of this indicator: Organic farming is not always environmentally sound or the best alternative, when considering specific environmental impacts (e.g., some acceptable organic pesticides are highly toxic to humans and wildlife, and organic farmers may use as much fossil fuels as

other farmers).

((3) The amount of acreage enrolled in federal conservation programs is increasing. (Activity = production)

Measure: Acreage in Conservation Reserve Program (CRP), Conservation Security Program (CSP), Environmental Quality Incentives Program (EQIP) and Wildlife Habitat Incentive Program (WHIP). Sources: <http://www.ers.usda.gov/Briefing/ConservationPolicy/programs.htm>; <http://www.nrcs.usda.gov/programs/> and Farm Service Agency (2007)

Explanation: The CRP, EQIP and WHIP are the largest of the federal programs that encourage farmers to set aside land prone to degradation, or provide incentives for environmental quality and habitat improvement. CSP is a relatively new program to promote conservation on working land; the name was changed to Conservation Stewardship Program (CStP) in the 2008 Farm Bill.

Limitations of this measure: Amounts of land enrolled in each program are not available for the current year, and not available in consistent formats across programs (which are administered differently). EQIP and WHIP do not provide easily-accessible information in terms of acreage, only dollars expended and contracts funded. Data on the Conservation Security Program were provided only by watershed and estimates of number of farms included.

Limitations of this indicator: Specific provisions depend on the particular program and some are stronger than others. EQIP in particular has been criticized for subsidizing conservation measures by confined animal feeding operations. Program participation is voluntary, so these programs do not necessarily take all vulnerable land or even the most vulnerable land out of production.

(4) The number of top 10 US food and beverage manufacturers by sales that report GHG emissions and participate in a GHG reduction program is increasing. (Activities = processing, distribution)

Measure: Top 10 companies in 2008 from <http://www.foodprocessing.com>; participation in US EPA Smartway Transport Partnerships (energy conservation), US EPA Climate Leaders, Climate RESOLVE or Chicago Climate Exchange from program websites.

Explanation: These programs not only inventory GHG emissions but also work with companies to set and track reduction goals. Several other programs (e.g., World Resources Institute's GHG Protocol, Global Reporting Initiative, and Carbon Disclosure Project) are designed mainly to inventory emissions. This is one of the few publicly-available data sets that show greenhouse gas emissions from a sector other than agricultural production.

Limitations of this measure: Data on program participation are self-reported, and the actual amounts of GHG emission reductions are not disclosed. Companies have an incentive to green wash (appear to be doing more to promote environmental quality than they actually are) and there are few penalties for giving misleading data.

Limitations of this indicator: GHG emissions are only one of many environmental impacts of food and beverage companies, although an important one. All data about environmental impacts and the measures taken to reduce these are self-reported on a voluntary basis. We see this as a weak indicator, but we included it because it seemed to be the best available in public data dealing with food system activities beyond production.

PROMISING INNOVATIONS – AFFORDABILITY

(1) Low-income people's access to fresh, locally grown produce is increasing. (Activities = distribution, sales, consumption)

Measures: number of WIC Farmers Market Nutrition Program and Senior FMNP clients.

Source: <http://www.fns.usda.gov/wic/FMNP/FMNPfaqs.htm>

Explanation: The WIC and Senior Farmers Market Nutrition Programs provide coupons that low-income mothers and seniors can use in farmers' markets. We included this indicator because it is an example of a program that can benefit both farmers and low-income consumers, even though the total amount of funds available per customer is tiny.

Limitations of this measure: Latest data available for both programs are from 2007.

Limitations of this indicator: These two programs are very small and serve a very small percentage of the low-income population. Farmers Market Nutrition Program coupons are set at a maximum of \$30 per year in federal money (although states can supplement this level). These two programs do not provide enough money to participants at present to make much of a difference in overall food affordability.

NEXT STEPS

APPROPRIATE USE OF SUGGESTED INDICATORS

In our WKKF “good food” project, we tried on our own to flesh out what HGFA [healthy, green, fair and affordable] meant to us. It became clear that there were things we cared about that were not embraced by HGFA. You captured this essence in your section “Beyond Good Food” and I salute you for that. We should not be held hostage to a framework that limits our vision. (FAS Grantee, personal communication)

The National Indicators, Hot Spots and Promising Innovations in the previous section are hardly the final word on good food. At best, they are grist for a fuller, more representative conversation about how to measure the “goodness” of our food and the food system that brings it to us. We had hoped that we would be able to deliver simple, incontrovertible metrics for determining how far along the road toward “good food” the US food supply has come; and we were not able to do that. In fact, as a result of this project, we propose that a single metric of the proportion of the US food supply that is good food will be at best misleading, and at worst, subject to abuse. The dimensions of good food—whether healthy, fair, green and affordable or some other set of attributes—are not collapsible into a single number.

We have left ourselves open to the charge that we evaded the task before us. We hope that our efforts to uncover the meaning and complexity of healthy, fair, green and affordable speak for themselves. These concepts are slippery, and they mean different things to different people situated differently in the food system. In addition, the data to track the amount of food that might be described as healthy, fair, green and affordable are sometimes unavailable or

inconsistent and thus incomparable across years or spatial regions. Of course, there are ways to deal with these issues. One of the first steps is to recognize that different users operating at different points in the food system and dealing with different scales have distinctly different needs for indicators; there is no single set of “best” indicators. Accepting that one’s location in the food system and one’s goals determine one’s need for indicators also requires acknowledging with humility that healthy, fair, green and affordable may not be the best overall attributes for national indicators.

This does not mean that any indicator is equally valid. What it means is that the people who will use the indicators have to set the definitions of attributes: At what point does healthy food become unhealthy? How much salt and fat are allowable in the food supply? Is there such a thing as a “bad food”? How much fairness will we sacrifice in the interest of “efficiency”? Does the looming threat of climate change mean that concerns about other attributes of good food need to take second place? And so on.

The only way to set legitimate national indicators is to premise them on legitimate national agreements about the kind of food system that people want in the US. This project displays some of the things that most people in the US do not want in our food system, by highlighting some aspects of the food system that need to be changed for greater environmental, economic or social sustainability. But the US is a long way from pinning down what people do want. At present, there are few national forums where citizens can even raise this issue, much less negotiate the complexities of the choice with all of the relevant stakeholders. Stakeholders such as industry representatives, farmer organizations, environmental advocates, consumer advocates, anti-hunger activists and others tend to work in silos, with considerable suspicion and misunderstandings of people in other silos.

So what good are the indicators we selected? We see the indicators as primarily useful to the FAS Initiative, and subsequent WKKF initiatives, in getting a better picture of the barriers to health, fairness, greenness and affordability in the US food system. The indicators also will be used to test assumptions in the theory of change (discussed more in the section below on “What we Learned”). We also hope that the indicators might provide guidance in grantmaking by narrowing the field of important barriers to achieving a healthy, green, fair and affordable food system and helping to narrow possible evaluation questions. That is, projects that are tackling problems such as farmworker wages or small- and mid-scale farm viability or greenhouse gas emissions from food systems (and have plausible, testable assumptions of how their work will increase wages, increase farmer satisfaction and income and decrease price volatility, or decrease greenhouse gas emissions) are dealing with some of the big issues that prevent sustainable food systems at present. In contrast, for example, projects that aim only to increase the local supply of food are missing the boat: “localness” is valuable if it increases the healthfulness, affordability, fairness and environmental quality of agriculture but not merely because it is local. Of course, many connections between local and regional food systems and good food attributes can be made. The point is that projects need to be evaluated on how they address health, fairness, environmental quality and affordability—not just on their contributions to building a local food system.

Why did this project come up with different indicators than other current indicator development projects in US agriculture? Our indicators paint a darker picture of US agriculture than some of the other projects that have published indicators recently (e.g., State of the Nation’s Ecosystems Project [2008]; Keystone Alliance for Sustainable Agriculture [2009]). This was largely because we had a different client and different objectives. We were asked to consider fairness and affordability; these two attributes usually get short-changed in agricultural indicator projects. Also, we did not adjust the indicators for productivity or yields, as the Keystone Alliance did. This was because the FAS Initiative is not in the business of increasing agricultural productivity; it is working toward “a future food system that provides all segments of society, especially those most vulnerable, a safe and nutritious food supply, grown in a manner that protects health and the environment, and adds economic and social value to rural and urban communities” (FAS website). Balancing the interests of all segments of society, with special attention to those who are most vulnerable, requires special attention to fairness and affordability. These are the places where our indicators show the worst current problems.

The US food system has been remarkably productive and remarkably profitable, for some members of society. But it is becoming increasingly apparent that sustainability, with its lens of equity and long-term maintenance of ecosystem services, has not fared as well over the last few decades of US agricultural

development. Our indicators help to shift the focus to segments of society who have not fully enjoyed the benefits of agricultural development and to the prospects for future generations to have food that is even more healthy, fair, green and affordable than the food that the present generation has.

BEYOND GOOD FOOD

The following food and food system attributes are, as we have discovered, important to many people but not directly encompassed by healthy, green, fair and affordable as we have defined them. They are not listed in any order of priority.

- food democracy and choice (whether citizens can control if “good food” will be available to them, and whether they know where to buy alternatives such as poultry grown organically and slaughtered humanely)
- diversity of scale of food businesses (i.e., whether policies are in place to encourage the growth and profitability of small-scale and medium-scale as well as large-scale food businesses)
- transparency about ingredients, production practices, profits, etc., including labels that list ingredients of concern to customers, such as genetically-modified content
- local/regional food production and marketing (While this could be considered part of the “green” attribute, several studies show that environmental benefits of lower “food miles” depend on production methods and the mode of transportation of both the food and the customers. Food systems with more food miles may have lower greenhouse gas emissions. There are additional benefits of local/regional food systems to community economic development, but this is not part of the scope of healthy, green, fair and affordable.)
- ease with which new farmers can acquire land and resources necessary to start farming
- influences on whether people actually consume good food, such as advertising and nutrition education
- animal welfare
- amount of food wasted in the US food system
- whether the right to food is recognized and implemented
- whether people who cannot afford food receive assistance in ways that preserve their dignity
- “process indicators” such as whether corporate social responsibility (CSR) is embedded in food companies’ organizational structures, and how many food companies provide meaningful CSR reports
- extent to which the true costs of food are internalized in prices paid
- intersections of local food, federal nutrition programs and charitable food distribution (e.g., whether local food is distributed regularly by food assistance programs)

- dietary changes such as eating less meat, decreased average caloric intake, eating seasonally, eating locally produced foods, eating a more diverse diet, and eating less processed food (Eating less meat and eating less processed food do not belong in the “healthy” category now because they are not part of current official dietary recommendations. However, they are captured to some extent by the suggested indicators of decreases in diet-related diseases, obesity and overweight.)
- changes in allocation of land to different crops to accommodate the requirements of healthy diets (e.g., less corn and soybeans, more greens and fruits) and environmental constraints (e.g., not trying to grow tomatoes and rice in arid or semi-arid regions)
- community health and vitality attributable to community economic development through food enterprises
- social capital in the food system (e.g., relationships of knowledge and trust between producers and consumers; presence of producer, consumer or multi-stakeholder networks and associations)
- communal aspects of food consumption (e.g., whether meals are eaten with family)
- access to “fine dining” by low-income people, and greater extension of the concept to include local and seasonal foods
- proportion of government subsidies going to large versus small farmers
- extent to which farm production is privately subsidized (the wife drives a school bus, the farmer works exploitative hours, etc.)
- cultural aspects of food production, preparation and consumption, including the diversity of foodways and preservation of historic varieties

WHAT WE LEARNED AND IMPLICATIONS FOR A THEORY OF CHANGE TOWARD GOOD FOOD

THE PURPOSE OF INDICATORS—WHAT THEY CAN AND CANNOT DO

Indicators have a kind of mystique: the need to develop good indicators is touted frequently now, as a way to make progress toward goals that have been rather nebulous. But indicators are not a way to make progress in and of themselves. They are just a tool to encourage people to pay attention to trends that affect what they value, and to know if the remedies they put in place are having the desired effects. Therefore, rather than starting with the development of national indicators of good food, a national effort would be better served initially by getting the multistakeholder discussion of values right and determining shared national goals, based on good information about trends in agriculture and their consequences. Indicator development can add value if it furthers the discussion of stakeholder values and goals.

Indicators cannot make a business case for sustainability, although they can help a business that has already made the decision to move toward greater sustainability. For example, developing indicators specific to a business that demonstrate a combination of financial success, reduced environmental impact or even contribution to resource stewardship, and production of a healthy food product offered at an affordable price through an equitable supply chain would help the business monitor its progress and make the case to outsiders that more businesses like this should be replicated and deserve investment. Indicators of sustainable food systems provide information useful to businesses that want to demonstrate that they are moving in this direction or contributing to sustainability in meaningful ways. More work is needed on the conjunction between the use of indicators for food systems and businesses: parsing out the contributions of one business/farm or supply chain to the sustainability of the food system in a given place is extremely difficult. A company

needs to look at where it can have the most impact (or where it does have the most impact, based on life-cycle analysis), and where/how it wants to change its practices to change its impact, to start addressing its own contributions to sustainability. Its indicators are likely to be reduction or improvement in these impact areas, or a proxy for them.

HOW TO DESIGN INDICATORS THAT ARE USEFUL (AND WHY PEOPLE KEEP STARTING FROM SCRATCH)

As we did the literature review for this project, we could not help noticing the superfluity of indicators and indicator development projects that have already tried to answer some of the questions we addressed. Yet few of these indicator sets seem to be used after they were developed, and each group that wants indicators seems to start from the beginning instead of adopting another group's work.

We realized that indicators must be tailored to the audience that will actually use them. Ideally, they are developed by that audience; at the very least, they have to connect with the audience's deepest concerns. Unless people have a strong incentive to use a set of indicators (e.g., to get grant funding, to qualify for government payments, to demonstrate compliance with regulations) they are quite unlikely to adopt them. Instead, they will use the indicators that show whether they are making progress on the goals that do concern them, such as putting money in their bank accounts, leaving a farm in better condition than when one inherited it, or fighting unjust work conditions.

As stated earlier, national indicator development needs to happen within the context of a national, transparent, bottom-up, multistakeholder discussion about goals and values related to food systems. Indicators in different domains are often correlated; if effort is put toward achieving one goal, other goals may fall in line. For example, farms remaining productive have community benefits as well as economic benefits to the farm families. Indicator development can emphasize identifying these key leverage indicators that will lead to change across much of the system. The indicator development process developed by Yellow Wood Associates, which influenced this project, attempts to find both key "upstream" leverage indicators and key "downstream" indicators that can be used to test assumptions about how the food system functions. Looking for these key indicators will help to avoid an unwieldy number of indicators and metrics. Many indicator projects result in a mass of data that is overwhelming and unmanageable, but data alone are virtually useless. They must be filtered to get at what is most important, then presented in a way that is intelligible to the audience. (Although this was one of the lessons of this project, we are not suggesting that the graphics we used to present indicators are the best possible. We strove for clarity for our client, not data presentation methods that would be most useful for public education about the status of health, fairness, environmental quality and affordability in the food system.)

DATA INADEQUACIES AND GAPS

Data for monitoring the sustainability of food systems are scarce and generally inadequate. Most of the publicly available data on agriculture deals with quantity of production, not aggregation, processing, distribution and packaging. There are other extensive sets of data that deal with consumption, but very little integration between the consumption and production data (with a few exceptions, such as a recent attempt by ERS researchers to determine how crop production patterns would change if the US public ate in closer accordance with dietary guidelines in Buzby et al. [2006]).

There is a mismatch between the data that are publicly available and the questions that the public wants and needs to be able to answer to know if the US is making progress toward more sustainable food systems. One of the experts we interviewed, who later reviewed the draft indicators, stated this succinctly:

You get what you measure; but as a society, we probably measure what we care about, and we have not cared about the healthfulness, sustainability, justness, or affordability of our food supply.

Another interpretation of the lack of good, publicly available data related to good food attributes is that we actually have cared about these things, but made

the wrong assumptions about how to achieve them. For example, we assumed that if there was enough food (production) to keep prices low, then health, affordability, fairness and environmental quality would follow in due course. This assumption is not correct: the US food supply is abundant, but the food system still has many unwanted impacts such as those we included in national indicators.

We found that the data related to fairness, such as data on farmworker health and workers' rights, are especially weak. Sometimes this is because of problems getting the information from people who are transient and undocumented (thus hard to track and wary of being interviewed by anyone "official"). But sometimes it seems to be due more to a willingness to overlook injustices, as long as the food supply is abundant. Even though progress on a few issues is discernible, wages, working conditions and legal rights for the lowest-paid people in the food system lag far behind those for other kinds of workers. The lack of good data impedes people who are making sincere efforts to improve conditions for low-wage and marginalized workers. For example, many advocates use a figure of 49 years as the average life expectancy of farmworkers. This figure is not supported in the data that have been collected on farmworkers, but there is no question that the conditions under which farmworkers live and work have a toll on their life expectancy. Being able to quantify that toll in reduced life expectancy may be a compelling tool for communicating poor living and working conditions.

In addition to the lack of agreement on how to measure farmworkers' welfare, there is a somewhat surprising lack of agreement on how to measure farm success—surprising because a tremendous amount of national data on farms and farmers is collected. Yet data emphasize financial indicators of success, and farmer satisfaction may be a better indicator of sustainability than farm net income. Many farmers continue to farm even when they are no longer making money. The lack of national agreement on desired diversity of scale in farming also contributes to data gaps. Data are analyzed and reported according to a farm typology that may not match the kind of farmscape that the public really wants to support. This discrepancy has emerged recently in disputes over "factory organic" production, and the widespread assumption that most large-scale farms are not "family" farms.

While far more attention has gone into measuring environmental sustainability than fairness, much of the environmental data is spotty and not sufficiently timely to guide decision makers. For example, there is only one solid data point for the impacts of pesticides on water quality in agricultural watersheds (from NAWQA); and this covers the time period of 1992-2001. While these data are strong, many policies and practices have changed since then. Pesticide impact data needs to be available more frequently than on a decadal basis in order to inform policy and to know if previous modifications are having an impact. In addition, environmental quality data and analyses based on them are often difficult to access on-line. Much of the environmental data relevant to good food is complex and technical, so raw data would be of little use to the average person. Other OECD countries seem to be doing a better job of monitoring and displaying environmental data than the US.

It is likely that many of the data gaps noted in this report will be addressed soon because NGOs are exerting increasing pressure to monitor social trends more comprehensively and food businesses also have a growing interest in environmental and social data for multiple reasons. Public input on the gaps and ensuring that the data remain publicly available are very important. The current methods for soliciting that input (for example, announcements on the USDA website of meetings of the Advisory Committee on Agriculture Statistics) may not be adequate to get representative stakeholder input; these methods are more likely to attract special interests with special needs for data to be collected (or not collected).

IMPLICATIONS FOR A THEORY OF CHANGE

As a result of an overall focusing and redirection at WKKF, the FAS Initiative is no longer in operations; however a number of its concepts and related activities have been integrated and translated as part of the new Food and Community Initiative. Studies such as ours provide a valuable lens to assess the larger program of initiatives such as the FAS Initiative, with the benefit of hindsight.

Markets operate within a complex web that affects supply and demand. These other loops, and their impacts at different stages of the food system, need to be detailed as fully as the market loops. Otherwise we will miss some ways to promote growth of good food. The FAS Initiative's theory of change deals with supply and demand, and does not include structural barriers that impede good food and access to it. Three examples:

- a) The legal framework affecting workers' rights makes fair food almost impossible to produce in the US, regardless of consumer interest. Farmworkers are exempt from the National Labor Relations Act, which safeguards rights for most other workers. Therefore, they do not have legal recourse to protest existing abuses of many workers' rights.
- b) The current structure of subsidies and incentives makes production and distribution of "green" and healthy food highly unlikely on a wide-scale basis. Until these are changed to support increasing environmental quality and public health, the supply will probably remain low.
- c) Large investments in food marketing and advertising can set up counter loops that negate the force of increasing consumer demand for healthy, green and fair food. This may result in consumers continuing to buy unhealthy foods, or foods marketed as "green" that meet only a skimpy list of environmental criteria.

The role of science and technology is not apparent in the FAS theory of change. "Innovation" is in one of the feedback loops supporting the growth of good food, but what is its source? And how do innovators deal with the substantial investment in science and technology that may actually impede the growth of healthy, green, fair and affordable food? An example of this is the vast investment in food processing that has resulted in a food supply less healthy than whole foods. This is not the sole result of food processing, of course: some processing increases safety and nutritional value of food. Yet much current food processing is aimed more at increasing marketability and profits than health.

"Affordability" is especially problematic in the FAS theory of change (and the theory may not have been designed to deal with it at all, in fact). How should affordability fit in a theory of change toward good food? One might argue that prices of healthy, green and fair food will drop as supply increases, making good food more affordable. But if producing, distributing and retailing good food costs significantly more than producing, distributing and retailing other kinds of food, then consumers may not see a drop in prices. Affordability is the most deeply contextual of the good food attributes, and more amenable to public policy measures than supply-driven measures. The most straightforward solution to higher prices of good food seems to be subsidizing its access for people who cannot afford the full cost, and doing this in ways that preserve people's dignity. In fact, this is exactly what some of the Promising Innovations do (such as the Farmers' Market Nutrition Program, which lets mothers in the Women, Infants and Children Program buy some produce at farmers' markets with coupons). The current public policy measures are woefully inadequate to make good food widely available to low-income people, however.

Finally, the FAS theory of change does not include indicators as a feedback. Results of the measure of indicators must be fed back into the system to have an impact. Continuing to rely on prices as the only important information for market corrections will not produce the systemic changes that are needed to make progress toward more good food for more people. Other sets of indicators have been created that emphasize non-market goods, but systems that make indicators readily available in a consistent and timely manner are also necessary. Furthermore, the value of indicators needs to be tested: do they affect behavior and planning? Under what circumstances?

The critique of the FAS theory of change in this section, and other sections of this report that critique the approach of this project or the FAS Initiative to good food, should not be construed as singling out WKKF uniquely for its approach. The Foundation is no more "wrong" in its focus than anybody else working to

reform the US food system. The US is taking its first steps toward understanding sustainable consumption and what this means in food systems. WKKF is to be commended for exploring how indicators fit into this effort. Although we argue that developing indicators for good food is somewhat premature, since there is not yet a public forum and vigorous national discussion for deciding the desired end-points, indicators are an essential part of food system reform.

RECOMMENDATIONS ON RESEARCH NEEDS

This project opened up many new questions, as most research projects on important topics do. This section highlights a few of the questions that seem worth exploring in the future.

1) Social indicators overall and social impacts of food systems. It became apparent in the course of this study that much of the data on the social impacts of the current food system is either absent or poor quality. Examples include data on farmworker health and quality of life; data on quality of life of other workers in low-wage jobs in the food system (e.g., food processing, retail, fast-food service); and community impacts of food system alternatives. If the goal is to maximize not only agriculture's contributions to food production, but also its multiple contributions to livelihoods, quality of life and community well-being, data on social impacts needs to be strengthened.

2) Environmental indicators (especially applying to food systems vs. agricultural production). We found that environmental indicators focus on the impacts of agricultural production practices, not on the entire food system. Better data on the environmental impacts of food system alternatives (different kinds of supply chains) can help direct policies that create incentives and disincentives for the development of food system alternatives.

3) Promising Innovations and whether they are actually correlated with greater access to and consumption of good food. Most of the Promising Innovations that we selected for this project seem to show potential for increasing multiple attributes of good food simultaneously. However, tracking the development of these innovations and testing whether they have real impacts on access and consumption is needed to test our assumptions.

4) Limitations of state and regional data relevant to "good food". Some national data that feeds into our National Indicators can be disaggregated and some cannot. Sometimes states are collecting their own data which is more relevant to good food than nationally-available data, and regions occasionally collaborate on data collection. To understand data availability and gaps in the US, it is necessary to examine these extra data sources at state and regional levels.

5) Multistakeholder consensus-building processes for food and agriculture. We emphasize at several points in this report that multistakeholder deliberation and decision-making processes are necessary to set the goals of food system reform, from which broadly-credible indicators can be derived. Such processes are not very common in the United States, although they are beginning to appear in other countries (e.g., the Sustainable Development Commission in the UK, which began as an agency under the British equivalent to our Department of Agriculture but recently became an independent "executive non-departmental body" reporting directly to the Prime Minister of England, the First Ministers of Scotland and Wales and the First Minister and Deputy First Minister of Northern Ireland) and intergovernmental decision-making (e.g., the Major Group structure of the Commission on Sustainable Development of the United Nations). Lessons might be learned from other countries' experience on how to set up and operate these multistakeholder bodies effectively, so that they can contribute to agricultural decision-making and the development of appropriate indicators.

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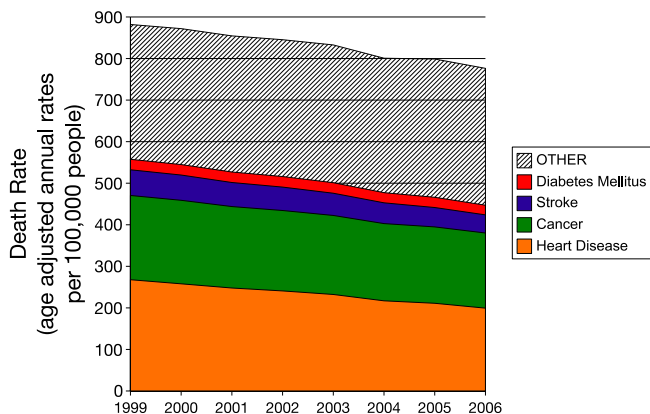
HEALTH TRENDS: NATIONAL INDICATORS

INDICATOR:

DEATH RATES OF DIET-RELATED DISEASES ARE DECREASING

CURRENT TREND: GETTING BETTER

US Death Rates: Diet-related Causes



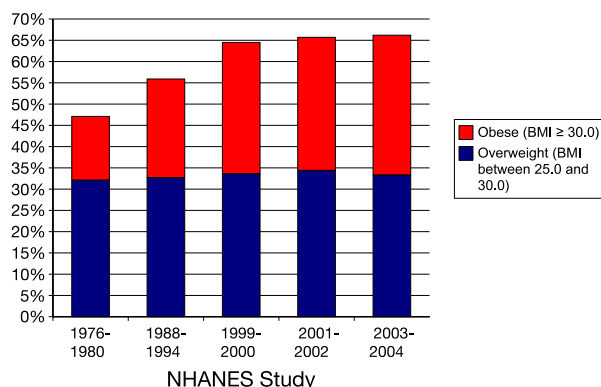
Source: National Vital Statistics Reports, National Center for Health Statistics, Centers for Disease Control

INDICATOR:

ADULT OVERWEIGHT AND OBESITY PREVALENCES ARE DECREASING

CURRENT TREND: GETTING WORSE

Prevalence of Overweight and Obesity: US Adults



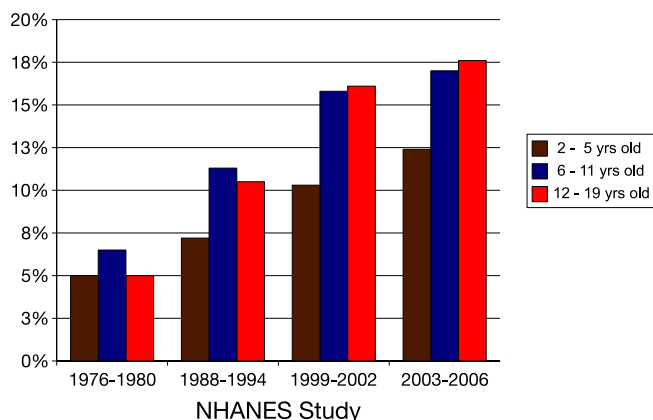
Source: National Center for Health Statistics, Centers for Disease Control

INDICATOR:

CHILD OVERWEIGHT PREVALENCE IS DECREASING

CURRENT TREND: GETTING WORSE

Prevalence of Overweight: US Children and Adolescents



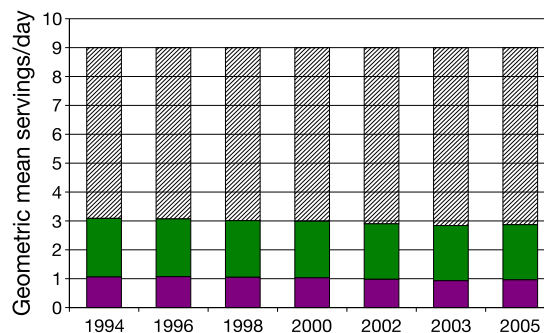
Source: National Center for Health Statistics, Centers for Disease Control

INDICATOR:

FRUIT AND VEGETABLE CONSUMPTION MEETS CURRENT US DIETARY GUIDELINES

CURRENT TREND: NO CHANGE

US Daily Consumption of Fruits and Vegetables



Four and one-half cups (nine servings) of fruits and vegetables are recommended daily for the reference 2,000-calorie level, with higher or lower amounts depending on the caloric level.

Source: USDHHS/USDA (2005)

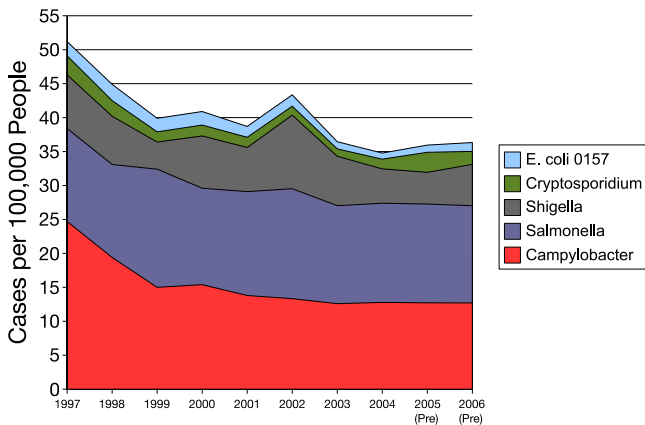
HEALTH TRENDS: NATIONAL INDICATORS

INDICATOR:

THE INCIDENCE OF FOOD CONTAMINATION IS DECREASING

CURRENT TREND: GETTING BETTER?

Incidence of Major Food-Borne Diseases



Source: Foodborne Diseases Active Surveillance Network (FoodNet), Centers for Disease Control

HEALTH TRENDS: HOT SPOTS

Incidence of Type II diabetes in children aged 10-19

Type 2 diabetes in children and adolescents, although still rare, is being diagnosed more frequently among American Indians, African Americans, Hispanic/Latino Americans, and Asians/Pacific Islanders. Based on 2002–2003 data, 15,000 youth in the United States were newly diagnosed with Type 1 diabetes annually, and about 3,700 youth were newly diagnosed with Type 2 diabetes annually.

Source: National Diabetes Fact Sheet, 2007. CDC.

Disparities in diabetes prevalence between white and colored populations

National survey data for people aged 20 years or older show that 6.6% of non-Hispanic whites, 7.5% of Asian Americans, 10.4% of Hispanics, and 11.8% of non-Hispanic blacks had diagnosed diabetes. Among Hispanics, rates were 8.2% for Cubans, 11.9% for Mexican Americans, and 12.6% for Puerto Ricans.

Source: National Diabetes Fact Sheet, 2007. CDC.

Cost to society of overweight and obesity

Medical expenses associated with overweight and obesity accounted for 9.1 percent of total US medical expenditures in 1998 and may have reached as high as \$78.5 billion (\$92.6 billion in 2002 dollars). Approximately half of these costs were paid by Medicaid and Medicare. State-level estimates range from \$87 million (Wyoming) to \$7.7 billion (California).

Sources: Finkelstein et al. (2003); Finkelstein et al. (2004).

Pesticide body burden

The CDC's National Report on Human Exposure to Environmental Chemicals provides an ongoing assessment of the US population's exposure to environmental chemicals using biomonitoring, or measuring the chemicals or their metabolites in blood or urine. The Third Report, published in 2005, included 43 pesticides. The report shows undetectable or very low levels of aldrin, endrin and dieldrin (organochlorine pesticides that have been discontinued in the US); detectable levels of mercury in women of child-bearing age, but below the level currently associated with neurodevelopment effects in the fetus; and widespread exposure to pyrethroid insecticides.

Source: <http://www.cdc.gov/exposurereport/>

Prevalence of antibiotic resistance due to animal agricultural production

Agricultural use, much of it for growth promotion of livestock, accounts for 40 percent of the antibiotics sold in the United States. Once-vulnerable bacteria have evolved resistance, and many antimicrobial drugs are losing their effectiveness. The CDC has concluded that, in the United States, antimicrobial use in food animals is the dominant source of antibiotic resistance among food-borne pathogens.

Source: *Prescription for Trouble: Using Antibiotics to Fatten Livestock, Union of Concerned Scientists.*

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Source: *National Diabetes Fact Sheet, 2007. CDC.*

COST TO SOCIETY OF FOOD CONTAMINATION

Pathogen	CDC estimate: annual number of cases	ERS estimate: Cost (2007 dollars)
Campylobacter (foodborne sources)	2,000,000	
Salmonella (all sources)	1,397,187	\$2,544,394,334
Shiga toxin-producing E. coli O157 (STEC O157) (all sources)	73,480	\$459,707,493
Non-O157 shiga toxin-producing E. coli (non-STEC O157) (all sources)	31,229	
Listeria (all sources)	2,797	

Source: *Foodborne Illness Cost Calculator, Economic Research Service, USDA*

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Source: *Prescription for Trouble: Using Antibiotics to Fatten Livestock, Union of Concerned Scientists.*

HEALTH TRENDS: NOTABLE FACTS

Diabetes prevalence

23.6 million people or 7.8% of the US population had diabetes in 2007. Among 49 states that have data for 1994 and 2005, the age-adjusted prevalence of diagnosed diabetes was at least 50% higher in 2005 than in 1994 in 27 states.

Source: National Diabetes Surveillance System, National Center for Chronic Disease Prevention and Health Promotion, CDC.

Fruit and vegetable consumption among adults

In 2005, only 32.6% of the surveyed US adult population consumed fruit two or more times per day, and 27.2% ate vegetables three or more times per day.

Source: Fruit and Vegetable Consumption Among Adults — United States, 2005. MMWR 56(10);213-217 (March 16, 2007).

Portion sizes

Between 1977 and 1996, portion sizes for key food groups grew markedly in the US, not only at fast-food outlets but also in homes and at conventional restaurants. One study of portion sizes showed caloric increases:

- Salty snacks from 132 calories to 225 calories.
- French fries from 188 calories to 256 calories.
- Hamburgers from 389 calories to 486 calories.
- Soft drinks from 144 calories to 193 calories.

Source: Nielsen and Popkin (2003)

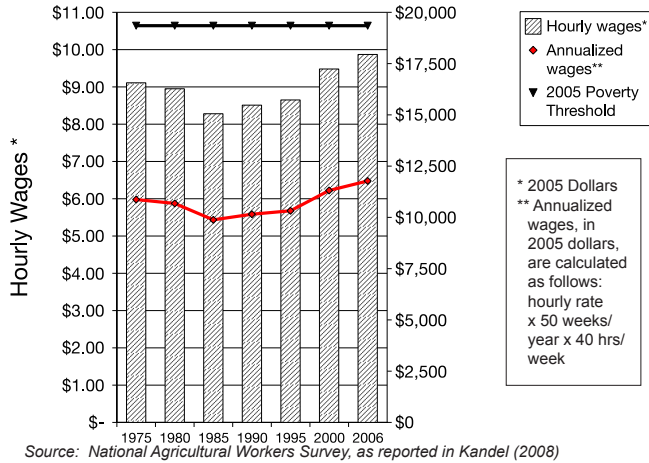
FAIRNESS TRENDS: NATIONAL INDICATORS

INDICATOR:

FARMWORKERS RECEIVE WAGES SUFFICIENT TO SUPPORT A HOUSEHOLD FOR FULL-TIME WORK

CURRENT TREND: GETTING BETTER

Field and Livestock Farmworkers' Wages

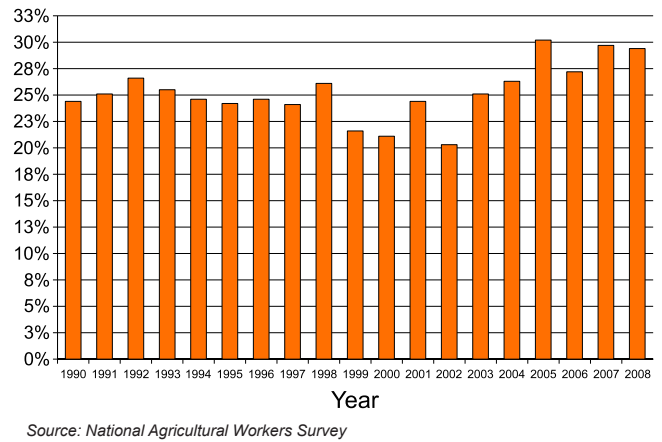


INDICATOR:

THE PERCENTAGE OF FARMWORKERS HIRED THROUGH LABOR CONTRACTORS IS DECLINING

CURRENT TREND: GETTING WORSE

Percentage of All Farmworkers Hired Through Labor Contractors

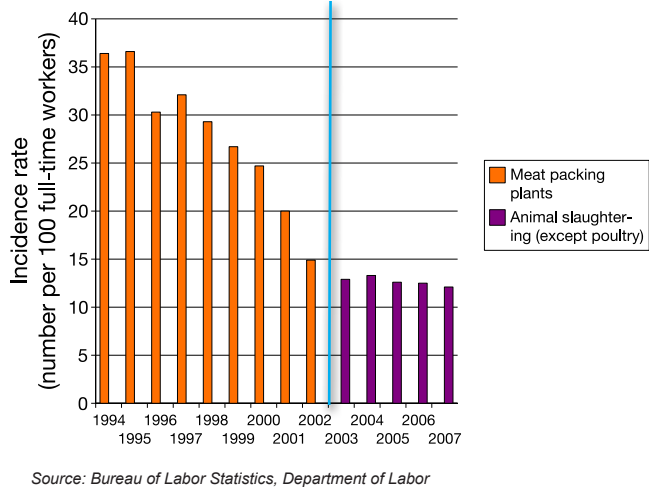


INDICATOR:

FOOD SYSTEM WORKERS HAVE SAFE, HEALTHY WORKING CONDITIONS

CURRENT TREND: GETTING BETTER?

Incidence of Nonfatal Injuries and Illnesses

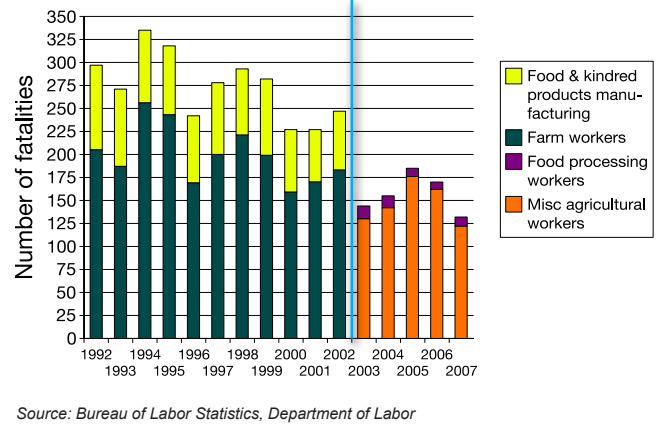


INDICATOR:

FOOD SYSTEM WORKERS HAVE SAFE, HEALTHY WORKING CONDITIONS

CURRENT TREND: MIXED

Fatal Occupational Injuries Farm and Food Processing Workers



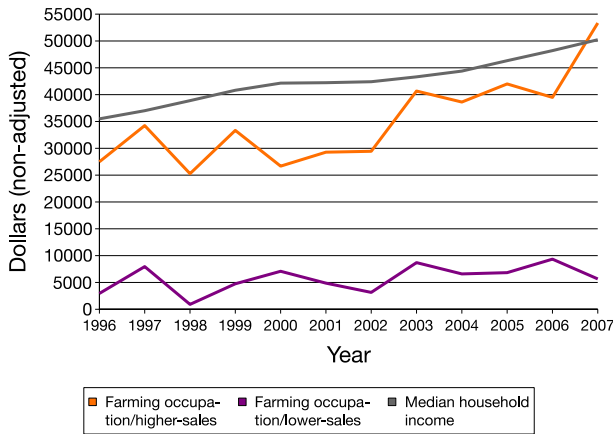
FAIRNESS TRENDS: NATIONAL INDICATORS

INDICATOR:

AVERAGE NET FARM INCOME OF SMALL & MID-SCALE FAMILY FARMS MATCHES OR EXCEEDS MEDIAN NATIONAL HOUSEHOLD INCOME

CURRENT TREND: MIXED

Average Net Income

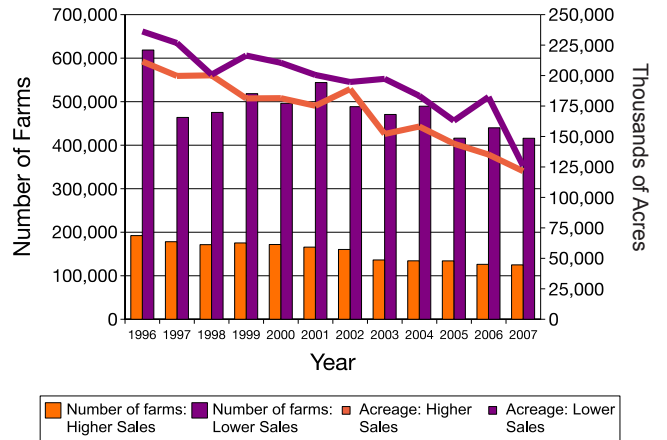


INDICATOR:

ACREAGE OF MID-SCALE FAMILY FARMS IS HOLDING STABLE

CURRENT TREND: GETTING WORSE

Status of Commercial Farms



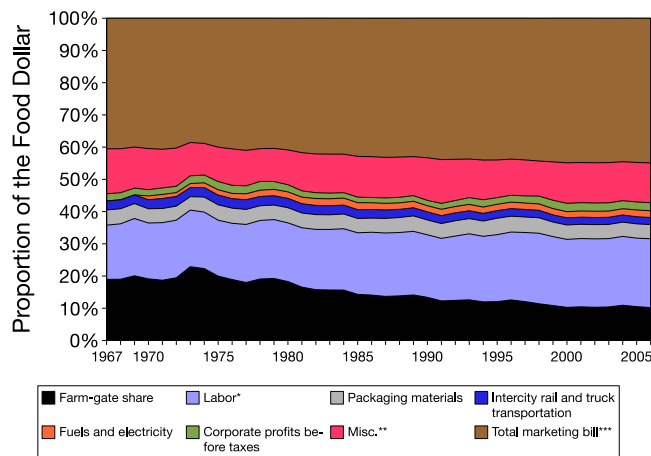
Source: ARMS

INDICATOR:

FARMERS RETAIN A CONSISTENT PROPORTION OF THE FOOD DOLLAR

CURRENT TREND: GETTING WORSE

Where the Food Dollar Goes



Source: Economic Research Service, USDA

FAIRNESS TRENDS: HOT SPOTS

Discrepancy in cancer rates and neurological disorders between farmworkers and other occupational groups

According to a California study, the risk of leukemia, stomach, cervical and uterine cancers was significantly elevated in California farmworkers in comparison with the state's Hispanic population.

Source: *Mills and Kwong (2001)*

In an Oregon study, the neurobehavioral performance of Hispanic immigrant farmworkers was found to be lower than that observed in a nonagricultural Hispanic immigrant population. Within the sample of agricultural workers, there was a positive correlation between urinary organophosphate metabolite levels and poorer performance on some neurobehavioral tests. These findings add to an increasing body of evidence of the association between low levels of pesticide exposure and deficits in neurobehavioral performance.

Source: *Rothlein et al. (2006)*

Concentration of market held by top companies within a sector

Hendrickson and Heffernan have documented trends in concentration ratios: the market share controlled by top firms within a specific industry. These demonstrate an extreme level and very rapid increase in concentration in most industries. Concentration ratios for several food industries in April 2007 were:

<u>Industry</u>	<u>Concentration Ratio</u>
• Beef packers (Tyson, Cargill, Swift & Co., National Beef Packing Co.)	CR4 = 83.5%
• Pork packers (Smithfield Foods, Tyson Foods, Swift & Co., Cargill)	CR4 = 66% (estimated)
• Broilers (Pilgrim's Pride, Tyson, Perdue, Sanderson Farms)	CR4 = 58.5%
• Turkeys (Butterball LLC, Hormel Foods, Cargill, Sara Lee)	CR4 = 55%
• Soybean crushing (ADM, Bunge, Cargill, Ag Processing)	CR4 = 80%
• Ethanol production (ADM, US Biofuels, VeraSun Energy Corporation, Hawkeye Renewables)	CR4 = 31.5%
• Corn seed (DuPont [Pioneer], Monsanto)	CR2 = 58%
• US food retailing (Wal-Mart, Kroger, Supervalu, Safeway, Ahold)	CR5 = 48%

Source: *Hendrickson and Heffernan (2007)*

Long-term decline in amount of farmland owned and operated by minorities, relative to declines in farmland owned and operated by whites

The number of all US farms declined 70 percent over 72 years—from 6,454,000 in 1920 to 1,925,300 in 1992—and the decline in farms run by non-Whites was even more dramatic—from 954,300 to 43,500, a 95 percent decline. Put another way, the proportion of non-White farms among all farms in the US fell from 15 percent in 1920 to 2 percent in 1992. The number of Black farms fell from 1 in 7 farms in 1920 to only 1 in 100 farms in 1992.

Source: *Hoppe et al. (1998)*

Of all the racial groups reported in the 1999 Agricultural Economics and Land Ownership Survey, Blacks own the smallest average acreage (114 acres per owner). Only one-third of Black-owned acres are operated by the owner; most Blacks rented their land to others (mainly Whites). In 1999, only 1.7% of farm owner-operators were Black, American Indian or Asian; and 1.9% were Hispanic.

Sources: *Gilbert et al. (2002)*

Pesticide exposure in farmworkers' children

In North Carolina, a substantial number of children (ages 1-6) of farmworkers had metabolites of organophosphate pesticides in their urine, especially metabolites of parathion/methyl parathion (90.0% of the children); chlorpyrifos/chlorpyrifos methyl (83.3%); and diazinon (55.0%). This study showed that farmworkers' children have multiple exposures to pesticides.

Source: *Arkury et al. (2007)*

In California, a study of primarily Latino children found significant correlations between six metabolites of organophosphate pesticides measured in pregnant women's urine and mental development and pervasive developmental problems in their children at 24 months of age.

Source: *Eskenazi et al. (2007)*

Number of child fieldworkers

Human Rights Watch estimates that 300,000 children work in the US as hired laborers in large-scale commercial agriculture, planting, weeding, and picking apples, cotton, cantaloupe, lettuce, asparagus, watermelons, chilies, and other crops.

Source: *Human Rights Watch (2002)*

Child farmworkers make up only 8% of children who work in the United States, yet account for 40% of work-related fatalities among minors.

Source: *Human Rights Watch (2002)*

FAIRNESS TRENDS: NOTABLE FACTS

Farmworker wages in comparison with other wage and salary workers

Farmworker unemployment rates are double those of all wage and salary workers. Those working in field crops have twice the unemployment rate of livestock workers.

Source: Kandel (2008)

Median weekly earnings of full-time farmworkers are 59% of those for all wage and salary workers. Poverty among farmworkers is more than double that of all wage and salary employees.

Source: Kandel (2008)

White control of farms and farm value

Of all private U.S. agricultural land, Whites account for 96 percent of the owners, 97 percent of the value, and 98 percent of the acres.

Source: Table 68, 1999 Agricultural Economics and Land Ownership Survey, ERS.

Concentration of seed industries

Monsanto has its genetically modified seeds for corn, cotton, soybeans and canola on more than 90% of the acreage that uses GMO seeds. In comparison, Syngenta is in 2nd place with about 4% of global biotech acreage using its seed.

Source: Hendrickson and Heffernan (2007)

Globally, four seed firms (DuPont [Pioneer], Monsanto, Syngenta and Limagrain) have about 29% of the world market for commercial seeds.

Source: UNCTAD (2006)

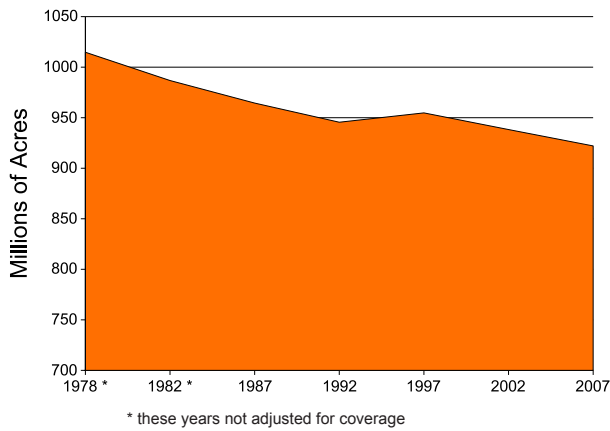
ENVIRONMENTAL TRENDS: NATIONAL INDICATORS

INDICATOR:

FARMLAND IS REMAINING IN PRODUCTION

CURRENT TREND: GETTING WORSE

Land in Farms



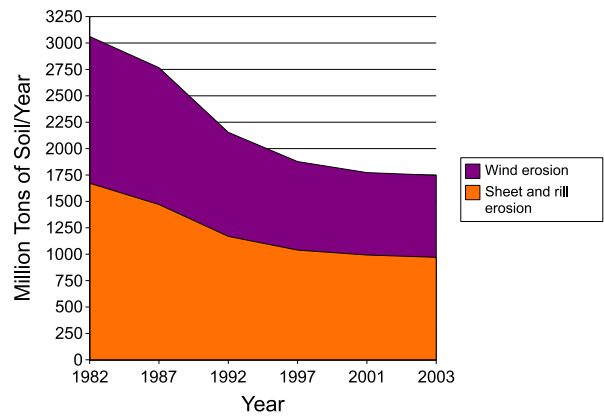
Source: US Agricultural Census

INDICATOR:

SOIL QUALITY IS IMPROVING

CURRENT TREND: GETTING BETTER

Total Soil Erosion from Wind and Water



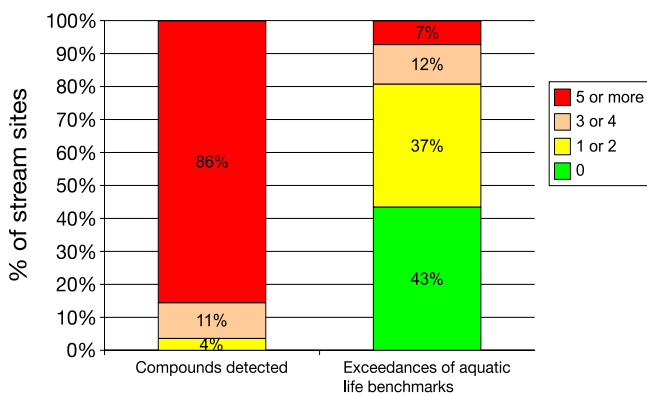
Source: Natural Resources Inventory, USDA Natural Resources Conservation Service

INDICATOR:

WATER CONTAMINATION BY PESTICIDES IN AGRICULTURAL AREAS IS DECLINING

CURRENT TREND: UNKNOWN

Pesticides in Streams in Agricultural Watersheds 1992-2001



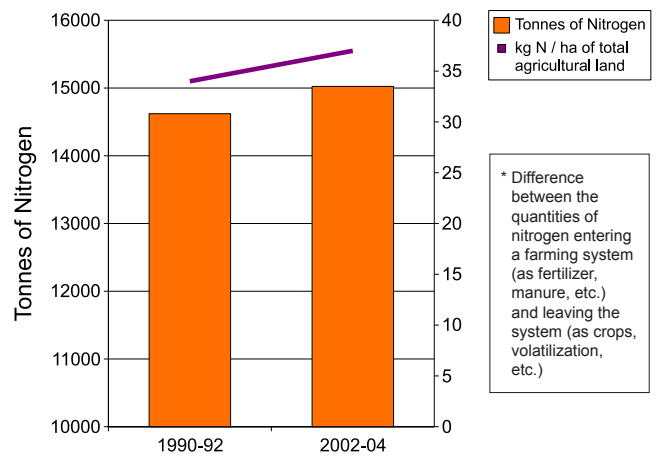
Source: National Water Quality Assessment Program, USGS

INDICATOR:

THE NITROGEN BALANCE OF U.S. FARMING SYSTEMS IS DECLINING

CURRENT TREND: GETTING WORSE

Nitrogen Balance*



* Difference between the quantities of nitrogen entering a farming system (as fertilizer, manure, etc.) and leaving the system (as crops, volatilization, etc.)

Source: OECD (2008)

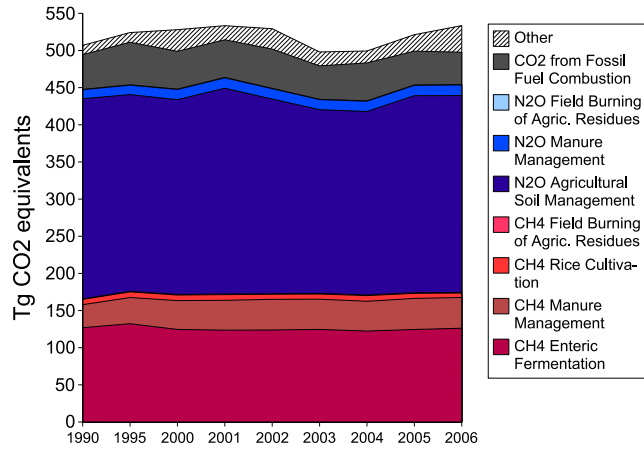
ENVIRONMENTAL TRENDS: NATIONAL INDICATORS

INDICATOR:

AGRICULTURAL PRODUCTION EMITS DECLINING AMOUNTS OF GREENHOUSE GASSES

CURRENT TREND: NO CHANGE

Emissions from Agricultural Sources



Source: US EPA (2008a)

ENVIRONMENTAL TRENDS: HOT SPOTS

Pharmaceutical, hormone and other organic contamination of fresh water from livestock facilities

Livestock wastes are potential sources of endocrine disrupting compounds to the environment. Steroidal estrogen hormones such as estradiol, estrone, and estriol are a particular concern because there is evidence that low nanogram per liter concentrations of estrogens in water can adversely affect the reproductive biology of fish and other aquatic vertebrate species.

Source: *Hanselman et al. (2003)*

Land application is widely viewed as an economic way of disposing animal manure and recycling nutrients. Agricultural lands, however, could be a potential source of environmental steroidal estrogenic compounds when animal manure is applied over long periods. Recent studies have indicated that runoff from applied fields, where manure has been applied, can enter adjacent streams or infiltrate through the soil into groundwater, resulting in detectable levels of estrogens that could affect wildlife.

Source: *Khanal et al. (2006)*

Estrogen contribution by livestock manure accounts for at least 90% of the total estrogen in the environment. Estrogenic hormones are frequently administered to livestock as growth promoters. This may increase urine output of estrogens.

Source: *Khanal et al. (2006)*

Growth of the Dead Zone in the Gulf of Mexico

The 2008 dead zone is the second largest on record since measurements began in 1985 and is larger than the land area of the state of Massachusetts. Increasing nutrient loads into the Mississippi River, beginning in the 1950s, are responsible for worsening oxygen conditions in the Gulf of Mexico since then. The second largest human-caused zone of hypoxia in the world's coastal waters is found in the Gulf of Mexico adjacent to the Mississippi River system.

Source: *National Oceanic and Atmospheric Administration*

Population trends of farmland birds

Farmland bird populations declined in all OECD countries that report population trends between 1991 and 2004, but the decrease was less pronounced than had occurred over the 1980s; and for some countries, populations have been rising since the late 1990s. The main causes of the decline in bird species impacted by agriculture are changes to the habitat quality of agricultural land or its loss to other uses, the use of pesticides and fertilizers, lowering groundwater tables and river flows, and clearance of native vegetation.

Source: *OECD (2008)*

Average number of calories from food system activities required to provide one calorie of food

The efficiency ratio is the quotient of harvested food energy and energy invested in the growing process. Traditional cropping powered by draft animals and human labor has ratios of 10-30; modern intensive grain cropping 2-8, fruit growing about 1, vegetable cultivation 0.1-1. Substantial energy losses are incurred in all modern intensive animal production systems, with ratios as low as 0.05 for lean red meat and no higher than 0.5 for milk.

Source: *cited in Smil (2008)*

ENVIRONMENTAL TRENDS: NOTABLE FACTS

Greenhouse gas emissions

In 2006, the agricultural production sector was responsible for emissions of 454.1 teragrams of CO₂ equivalents (Tg CO₂ Eq.), or 6% of total U. greenhouse gas emissions. Methane (CH₄) and nitrous oxide (N₂O) were the primary greenhouse gases emitted by agricultural production activities.

Source: US EPA (2008a)

Energy use in the food system

Energy inputs into farming are only a small part of the total energy inputs into food. Energy used in food processing, distribution, and wholesale and retail can be twice as large as that consumed by field farming and animal husbandry, and food preparation takes 30-50% of all the energy used in an affluent nation's food chain.

Source: Smil (2008)

In total, each American requires approximately 2000 liters/year in oil equivalents to supply their food, which accounts for about 19% of the total energy use in the USA. Agricultural production plus food processing and packaging consumes 14%, while transportation and preparation use 5% of total energy in the US.

Source: cited in Pimentel et al. (2008)

A vegetarian diet requires 33% less fossil energy than the average American diet.

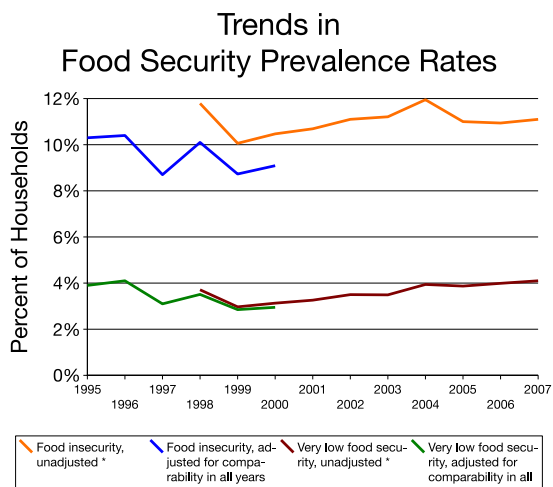
Source: cited in Pimentel et al. (2008)

AFFORDABILITY TRENDS: NATIONAL INDICATORS

INDICATOR:

THE PREVALENCE OF HOUSEHOLD FOOD SECURITY IS INCREASING

CURRENT TREND: **MIXED**

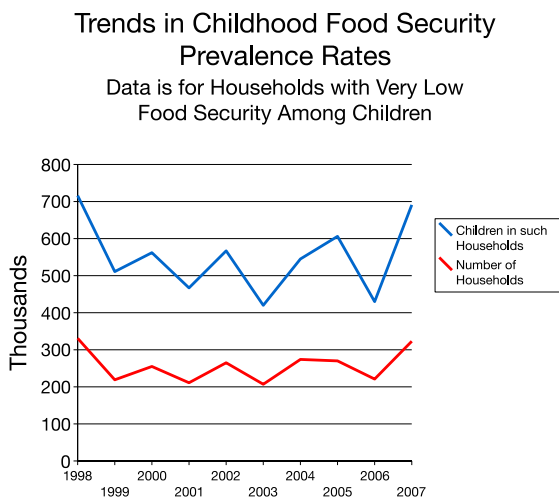


Source: Economic Research Service (based on Current Population Survey Food Security Supplement data)

INDICATOR:

THE PREVALENCE OF CHILD FOOD SECURITY IS INCREASING

CURRENT TREND: **MIXED**



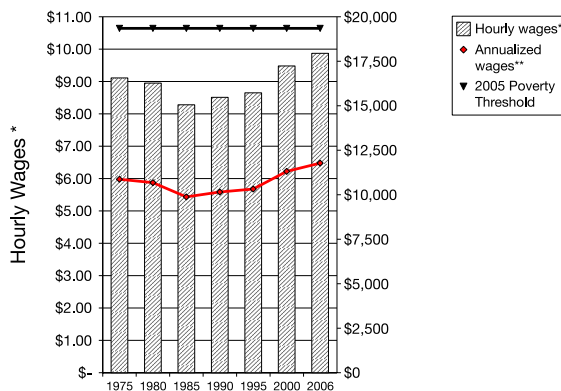
Source: Economic Research Service (based on Current Population Survey Food Security Supplement data)

INDICATOR:

INCREASES IN WAGES AND SALARIES ARE EQUAL TO OR GREATER THAN INCREASES IN FOOD PRICES

CURRENT TREND: **MIXED**

Field and Livestock Farmworkers' Wages



Source: Bureau of Labor Statistics

AFFORDABILITY TRENDS: HOT SPOTS

Incidence of Type II diabetes in children aged 10-19

Type 2 diabetes in children and adolescents, although still rare, is being diagnosed more frequently among American Indians, African Americans, Hispanic/Latino Americans, and Asians/Pacific Islanders. Based on 2002–2003 data, 15,000 youth in the United States were newly diagnosed with Type 1 diabetes annually, and about 3,700 youth were newly diagnosed with Type 2 diabetes annually.

Source: *National Diabetes Fact Sheet, 2007. CDC.*

Disparities in diabetes prevalence between white and colored populations

National survey data for people aged 20 years or older show that 6.6% of non-Hispanic whites, 7.5% of Asian Americans, 10.4% of Hispanics, and 11.8% of non-Hispanic blacks had diagnosed diabetes. Among Hispanics, rates were 8.2% for Cubans, 11.9% for Mexican Americans, and 12.6% for Puerto Ricans.

Source: *National Diabetes Fact Sheet, 2007. CDC.*

Cost to society of overweight and obesity

Medical expenses associated with overweight and obesity accounted for 9.1 percent of total US medical expenditures in 1998 and may have reached as high as \$78.5 billion (\$92.6 billion in 2002 dollars). Approximately half of these costs were paid by Medicaid and Medicare. State-level estimates range from \$87 million (Wyoming) to \$7.7 billion (California).

Sources: *Finkelstein et al. (2003); Finkelstein et al. (2004).*

Pesticide body burden

The CDC's National Report on Human Exposure to Environmental Chemicals provides an ongoing assessment of the US population's exposure to environmental chemicals using biomonitoring, or measuring the chemicals or their metabolites in blood or urine. The Third Report, published in 2005, included 43 pesticides. The report shows undetectable or very low levels of aldrin, endrin and dieldrin (organochlorine pesticides that have been discontinued in the US); detectable levels of mercury in women of child-bearing age, but below the level currently associated with neurodevelopment effects in the fetus; and widespread exposure to pyrethroid insecticides.

Source: <http://www.cdc.gov/exposurereport/>

Prevalence of antibiotic resistance due to animal agricultural production

Agricultural use, much of it for growth promotion of livestock, accounts for 40 percent of the antibiotics sold in the United States. Once-vulnerable bacteria have evolved resistance, and many antimicrobial drugs are losing their effectiveness. The CDC has concluded that, in the United States, antimicrobial use in food animals is the dominant source of antibiotic resistance among food-borne pathogens.

Source: *Prescription for Trouble: Using Antibiotics to Fatten Livestock, Union of Concerned Scientists.*

Cost to society of food contamination

Pathogen	CDC estimate: annual number of cases	ERS estimate: Cost (2007 dollars)
Campylobacter (foodborne sources)	2,000,000	
Salmonella (all sources)	1,397,187	\$2,544,394,334
Shiga toxin-producing E. coli O157 (STEC O157) (all sources)	73,480	\$459,707,493
Non-O157 shiga toxin-producing E. coli (non-STEC O157) (all sources)	31,229	
Listeria (all sources)	2,797	

Source: *Foodborne Illness Cost Calculator, Economic Research Service, USDA*

AFFORDABILITY TRENDS: NOTABLE FACTS

Diabetes prevalence

23.6 million people or 7.8% of the US population had diabetes in 2007. Among 49 states that have data for 1994 and 2005, the age-adjusted prevalence of diagnosed diabetes was at least 50% higher in 2005 than in 1994 in 27 states.

Source: National Diabetes Surveillance System, National Center for Chronic Disease Prevention and Health Promotion, CDC.

Fruit and vegetable consumption among adults

In 2005, only 32.6% of the surveyed US adult population consumed fruit two or more times per day, and 27.2% ate vegetables three or more times per day.

Source: Fruit and Vegetable Consumption Among Adults — United States, 2005. MMWR 56(10);213-217 (March 16, 2007).

Portion sizes

Between 1977 and 1996, portion sizes for key food groups grew markedly in the US, not only at fast-food outlets but also in homes and at conventional restaurants. One study of portion sizes showed caloric increases:

- Salty snacks from 132 calories to 225 calories.
- French fries from 188 calories to 256 calories.
- Hamburgers from 389 calories to 486 calories.
- Soft drinks from 144 calories to 193 calories.

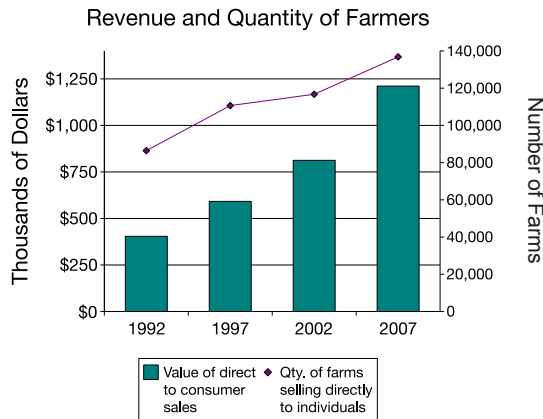
Source: Nielsen and Popkin (2003)

PROMISING INNOVATIONS: NATIONAL INDICATORS

INDICATOR:

DIRECT FARMER-TO-CONSUMER SALES ARE GROWING IN VALUE **CURRENT TREND: GETTING BETTER**

Direct Farmer-to-Consumer Sales

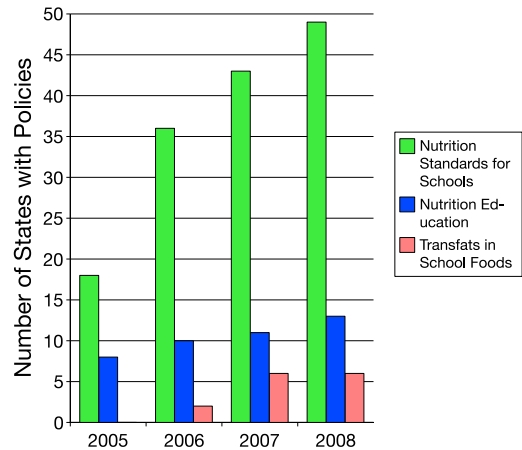


Source: Agricultural Census

INDICATOR:

PUBLIC POLICY PROMOTES HEALTHIER FOODS FOR CHILDREN **CURRENT TREND: GETTING WORSE**

Enacted Child Obesity Policies

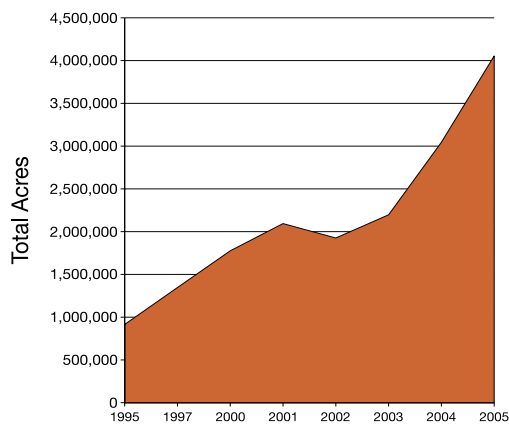


Source: National Conference of State Legislatures website, Childhood Obesity Legislative Policy Updates

INDICATOR:

THE AMOUNT OF LAND UNDER ORGANIC PRODUCTION IS INCREASING **CURRENT TREND: GETTING BETTER**

US Certified Organic Farmland

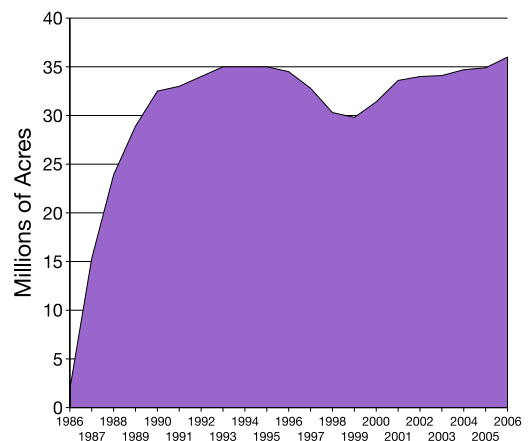


Source: Economic Research Service Data Set on Organic Production

INDICATOR:

THE AMOUNT OF ACREAGE ENROLLED IN FEDERAL CONSERVATION PROGRAMS IS INCREASING **CURRENT TREND: NO CHANGE**

Conservation Reserve Program



Source: Farm Service Agency (2007)

PROMISING INNOVATIONS: NATIONAL INDICATORS

INDICATOR:

THE NUMBER OF TOP 10 US FOOD AND BEVERAGE MANUFACTURERS BY SALES THAT REPORT GHG EMISSIONS AND PARTICIPATE IN A GHG REDUCTION PROGRAM IS INCREASING

CURRENT TREND:
MIXED

Rank	Company	EPA Smartway Transport Partner	EPA Climate Leader*	Climate RESOLVE	Chicago Climate Exchange
1	Tyson Foods Inc.	Yes	Yes	No	No
2	PepsiCo Inc.	Yes	Yes	Yes	No
3	Kraft Foods Inc.	Yes	No	No	No
4	Nestle (US & Canada)	No?	No	No	No
5	Anheuser-Busch Cos. Inc.	Yes	Yes	No	No
6	Dean Foods Co.	No	No	No	No
7	General Mills Inc.	Yes	No	Yes	No
8	Smithfield Foods Inc.	Yes	Yes	No	Yes
9	ConAgra Inc.	No	Yes	No	No
10	Kellogg Co.	No	Yes	No	No

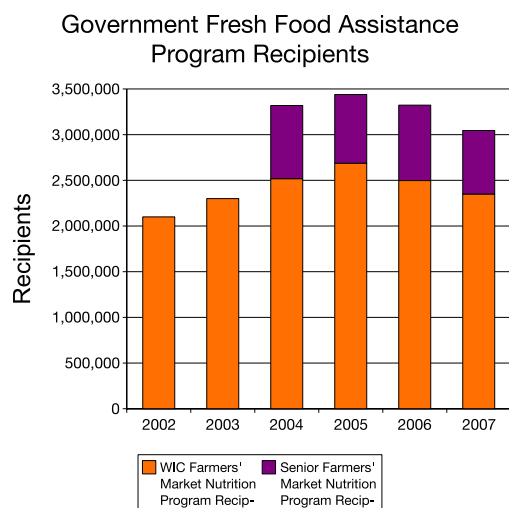
* Most companies list greenhouse gas reduction goals as "under development"

Source: Top 10 companies in 2008 from <http://www.foodprocessing.com>; program participation from program websites

INDICATOR:

LOW-INCOME PEOPLE'S ACCESS TO FRESH, LOCALLY GROWN PRODUCE IS INCREASING

CURRENT TREND:
GETTING WORSE?



Source: Food & Nutrition Service, USDA website

PROMISING INNOVATIONS: NOTABLE FACTS

Farm-to-school programs

There are 40 states at present with operational farm-to-school programs, and an estimated total of 2051 farm-to-school programs in the United States.

Source: National Farm to School Program, Center for Food & Justice, Occidental College

Producers with third-party certification of compliance with fair labor practices

At present, four producers are participating in a pilot of the Agricultural Justice Project Standards and 47 farms, ranches, coops, processors, packers or distributors are certified by Food Alliance standards in the United States.

Sources: <http://www.agriculturaljusticeproject.org/pilot.html> and <http://www.foodalliance.org/client-search>

Use of Integrated Pest Management (IPM) by farmers

A complete, practical, and accepted method to measure overall IPM adoption is not yet available. In practice, IPM is often based on scouting fields to determine pest populations or infestation levels, more precise timing and application of pesticides based on scouting, better knowledge of the consequences of various levels of pest and predator populations, rotations, and more precise timing of planting.

Scouting was used extensively by most field crop farmers in 2000:

- 57 to 90 percent of the major field crop acreage was scouted for diseases, with winter wheat the lowest and durum wheat the highest.
- 71 to 97 percent of the major field crop acreage was scouted for weeds, with winter wheat the lowest and durum wheat the highest.
- 62 to 91 percent of the major field crop acreage was scouted for insects, with winter wheat the lowest and cotton the highest.
- Crop rotations were used on at least 82 percent of the 1996 planted acres for major field crops except for cotton and winter wheat, where only 33 and 58 percent of the planted acres were in rotation, respectively.

Sources: Economic Research Service Agricultural Management and Production Technology: Pest Management Briefing Room (<http://www.ers.usda.gov/Briefing/Agchemicals/pestmanagement#adoption>) and Fernandez-Cornejo and Jans (1999)

PROMISING INNOVATIONS: NATIONAL INDICATORS

Direct farm-to-consumer sales

Although direct sales have increased between the 1992 and 2007 Agricultural Census, the proportion of total sales that they contribute is still tiny: in 2007, direct sales only made up 0.4 percent of total sales.

Source: *Agricultural Census*

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