

# Green Jobs in a Sustainable Food System





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# EXECUTIVE SUMMARY

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THE U.S. FOOD SECTOR is among the most productive in the world and is a significant driver of our economy. Yet, it's failing us in major ways – putting public health, livelihoods and our environment at great risk. Obesity and diabetes rates are rising, communities are plagued by food deserts, and agriculture runoff is the biggest source of pollution in our rivers and lakes.

The good news is that communities across the country are addressing this crisis in innovative ways. Through different community-based efforts, local activists and food advocates are finding ways to improve community health and environmental outcomes while creating a more economically equitable food system.

This report examines the five sectors within the food system: Production, Processing, Distribution, Retail, and Waste. Within each, it examines the environmental and economic equity problems, highlights the efforts of local communities across the country to address those problems, and identifies opportunities to transform jobs in the green economy and enhance environmental and economic equity outcomes in the future. The initial analysis of jobs in a green food economy promises opportunities for workers to build long-term skills, and emphasizes the importance of linking local efforts to broader regional and national policy platforms. This multi-level engagement and collaboration will help set in motion the systemic changes needed to create a more sustainable and equitable food system.

## Key Findings

- **Reform Requires a Food Systems Analysis.** All reforms related to food need to be understood and examined *as a system*. When agricultural models change, distribution must adjust. When retail patterns change, all suppliers must adjust. The food industry is an interconnected web and reform must be approached from such a perspective or risk being ineffective, or worse detrimental at other stages of the supply chain.
- **Greening the Food System Achieves Multiple Objectives.** The multifaceted nature of the food system presents an opportunity for *holistic* community economic development that promotes the health of people and the environment, strengthens community and cultural connections and advances the green jobs movement.
- **Cross-Sector Stakeholder Collaboration is Imperative.** Transformation of an interconnected food system requires a multi-level, multi-sector strategy with the ability to problem-solve locally, while addressing the larger economic and policy structures that influence standards of practice throughout the supply chain.
- **Momentum is Growing with New Partnerships and Coalitions.** Sustainable food advocates, the environmental justice movement and organized labor are coming together, lending experience and expertise to build a new platform capable of addressing the root causes of inequity and environmental degradation in the food system.
- **Local Efforts Must Engage Policy.** Local food system change is ultimately limited by policies that inform and shape the multi-sector food industry at the national level. Stakeholders who seek to affect change in the food system should not only consider how to foster and scale exciting innovation in their own communities but also consider policy advocacy around the food and agriculture policies of the federal government.

## A Call to Action: Next Steps for Practitioners, Community Activists & Policy Makers

- Build Capacity Locally.** To generate ongoing demand and increase momentum for innovative sustainable food practices, practitioners and advocates must engage in education, outreach and activism and connect with their counterparts in local communities across the country. Showcasing best practices will inspire stakeholders with *what is possible*. Building on work that is already occurring, new initiatives should connect to local priorities, and expand capacity broadly.
- Connect Local Innovation to National Policy.** As momentum for food system change grows, practitioners and food activists must continue to advocate for policy changes that green local food systems, encourage innovation and create replicable models for change locally, regionally and nationally.
- Use Policy as a Tool for Systemic Change.** To ensure long-term transformation of our food system, practitioners, community activists and policy makers need to (1) understand how local and regional issues connect to federal policy, (2) identify and connect with the many bodies of research and activism already underway to shape the Farm Bill in 2012, and (3) organize now to link to these reform efforts. Grassroots efforts equipped with knowledge and strategy can add their voice to the debate over the 2012 Farm Bill and have the potential to finally tip the scales toward a national policy that supports rather than works against a healthy, fair, and sustainable food system for all.

The chart below provides an overview of the current food system. The Appendices at the end of the report offer sector-by-sector findings of major crises and opportunities, and provide a detailed analysis of emerging occupations in a green food system.

Sector	Size in Sales (Billions)	Number of Employees	Green House Gas Emissions (% of food system)	Environmental Impacts
<b>Production</b>	\$300	997 K	60%	Uses about 80% of freshwater resources; soil degradation and water pollution from agricultural runoff.
<b>Processing</b>	\$589.5	1.5 M	10%	Accounts for 16% of food system energy use; packaging/containers make up more than 30% of municipal solid waste nationally.
<b>Distribution</b>	\$819.4	882 K	7-11%	Average transport from farm to table is 1,500-2,500 miles; requires large energy and fuel inputs, particularly for transport, refrigeration and warehouse technology.
<b>Retail</b>	\$918	11.9 M	15%	Supermarkets are the number one industrial emitters of HFC gases used as coolant in freezers; contributes to the 100 billion plastic bags used annually, made from 12 million barrels of oil.
<b>Waste</b>	N/A	357.7 K	8%	Residential and commercial food waste constitutes the 3rd largest waste stream after yard waste and paper: 36 billion pounds.



# INTRODUCTION

## Green Jobs in the Food System

UNTIL NOW, LITTLE of the research on “green jobs” has focused on the industry sectors that make up the food system. Instead, sectors such as renewable energy, energy efficiency and transportation have received most of the attention regarding their potential to produce green jobs. When the food system is considered at all, the reference is typically to agriculture and its relationship to the biofuels market. Few have considered the whole system that produces and manufactures food for human consumption as a site for sustainable economic development.

What are green jobs in the food system? Are they quality jobs with family supporting wages and career advancement? Do they expand ownership and community wealth opportunities? This report attempts to begin addressing these critical questions by (1) highlighting strategies for creating sustainable food economies on an enterprise and community level, and (2) identifying the type and quality of occupations needed in these emerging economies.

The term “green job” has been defined and evaluated in a myriad of ways, invoking different frameworks for what “green” means in economic development. This report approaches the green economy as an historical opportunity to simultaneously improve the natural environment and advance racial, gender and economic equity through new models of development.<sup>1</sup> It defines good, green jobs as those that are accessible and provide pathways out of poverty for historically disenfranchised communities, including low-income people, people of color and people with barriers to employment, such as a criminal record. It also acknowledges the need for the green economy to deepen community wealth building through locally rooted, collectively owned enterprises.<sup>2</sup>

Sustainable food reformers have always understood the economic development potential of food enterprise. Similarly, community leaders on the frontlines of the green economy have experimented with ways to expand healthy food while creating good jobs. However, while poor labor practices are endemic to the industrial food system, safe, quality jobs do not necessarily result from greening food practices. Unfortunately, worker justice is the most commonly ignored aspect of food system change. A survey of organic farmers recently showed that aside from reduced pesticide exposure, poor pay and working conditions on large-scale organic farms are not much different from their conventional counterparts. As this report considers what is on the horizon for sustainable food, it places the experience and opportunities of workers at the center of its analysis, mindful of the millions of people already working to grow, pack, ship, vend and dispose of our food.

## The Food System: An Environmental Crisis

More and more people are coming to recognize that the current food system in the United States is unsustainable, inefficient and unhealthy. The success of organic foods and, more recently, the growth of the local food movement have started to raise awareness among consumers that the way our food is produced and distributed

is in need of some major restructuring. From agricultural techniques to wasteful packaging to energy intensive transport, research links conventional food system practices to environmental degradation. The energy and climate change impacts alone are astounding:

**Green House Gases:** Globally, agriculture accounts for 14% of greenhouse gas (GHG) emissions.<sup>3</sup> Livestock production alone accounts for 18% of all GHG emissions in the world.<sup>4</sup> In the US agriculture constitutes 6% of GHG emissions.<sup>5</sup>

**Food Miles:** Food consumed in the US travels an average of 1,500 to 2,500 miles from farm to consumer.<sup>6</sup>

**Energy Use:** The US food system consumes 15 to 20% of the nation's energy.<sup>7</sup>

**Fossil Fuel Dependency:** Considering farm machinery, transportation, packaging and other petrochemical inputs, each American eats the equivalent of about 530 gallons a year in oil.<sup>8</sup>

**Intensive Water Use and Pollution:** Farming uses 80% of potable water in the US.<sup>9</sup> Agricultural chemicals are the biggest source of pollution in US rivers and lakes, and a major contributor to contaminated ground water and wetland degradation.<sup>10</sup>

**Soil Erosion:** The world has lost almost a third of arable farmland to erosion in the last 40 years,<sup>11</sup> weakening the potential of healthy soil to actually remove carbon dioxide from the air.<sup>12</sup>

**Environmental Injustice:** The UN Food and Agriculture Organization predicts that climate change will disrupt agriculture and global food supply, creating increased food insecurity for the world's most vulnerable populations.<sup>13</sup>

## **An Unhealthy Diet: Inequity for Communities and Workers**

Just as troubling as its impact on the environment, our existing conventional food system is failing to meet the basic food needs of many communities, particularly low income communities and communities of color. More than 50.2 million people lived in food-insecure households in the US in 2009, including 17.2 million children.<sup>14</sup> The term “food insecure” means a household that has limited or uncertain access to adequate food, usually due to lack of financial or other resources. Approximately one out of every four African American and Latino households face food insecurity compared to one in ten white households.<sup>15</sup> Food insecurity is further compounded by the sheer lack of healthy foods in many low-income communities, a condition commonly referred to as “food deserts.” Impaired access to healthy food results in higher incidence of diet-related diseases such as obesity, diabetes, and heart disease, which disproportionately impact communities of color.<sup>16</sup>

Our food system is also the site of some of the most dangerous and exploitative labor practices in the country. Workers all along the food chain in the US—including production, processing, distribution, retail and waste—face declining wages, poor working conditions and an uncertain future. Farm workers in particular toil long hours, risk their health from pesticide exposure, and earn poverty wages.

Our current food system practices are leading us down a path of greater climate uncertainty, social and economic inequality, and food insecurity. These consequences are not unrelated to one another but are rather all part of the same systemic failure.

## **The Evolution of a Systems Failure**

Following World War II, the industrialization of food production and processing created a system with large energy inputs at virtually every stage - from the use of chemical pesticides and fertilizers to heavy machinery to the trucks that transport food thousands of miles from farm to supermarket. Rising fuel prices have made farming and thus the food we purchase more and more expensive. From 2002 to 2007, US farmers' spending on gas, fuel, and fertilizer increased by 93 percent.<sup>17</sup> Small- and mid-sized family farms have been replaced en masse by large corporate farms, which over the years have consolidated their ownership over other parts of the food system like distribution and retail. More than 85 percent of beef cattle in the US are slaughtered by four firms, two companies sell half the corn seed, and one company controls almost 40 percent of the US milk supply.<sup>18</sup> The same trends exist in the supermarket industry, which has slowly abandoned working class and communities of color over the last 20 years.<sup>19</sup> This corporate consolidation has been accompanied by a decline in wages and worker protections.<sup>20</sup> Ironically, many of the workers who toil the land or distribute food products cannot afford the food they help produce.

## **Change on the Horizon: Movement Toward a Sustainable and Fair Food System**

Advocates for change have been working for decades to reform the food system in different ways. While the vast majority of food consumed in the US is produced within the industrialized food system, sustainable food efforts have gained significant ground in the last several years. Organic and sustainable farmers, environmentalists and consumer advocacy groups have generated enormous public awareness about the damaging effects of pesticide use and mono-crop mechanized farming. As a result, community-based food system projects have blossomed around the country, producing an unprecedented rise in community gardening, farmer's markets, and "buy local" campaigns. And, as nutrition-related disease epidemics such as obesity and diabetes have reached crisis levels, efforts to remake the food system have gained further momentum. Where diet-related health interventions long targeted changing individual behavior, public health officials now identify the problem as a systemic breakdown requiring systemic change.

A convergence between sustainable food and environmental justice movements in the last five to ten years has begun to shape a discourse of "food justice." Historically, the environmental justice movement has been very successful at exposing the disproportionate burden of environmental pollution on communities of color as evidenced by the location of incinerators or other toxic facilities. Now advocates are identifying the unequal racial effects of environmentally unsound practices in the conventional food system as well as the uneven distribution of healthy foods across race and class. The labor movement also has a long history of organizing and representing workers in the food system, fighting for health and safety measures, living wages and job security.

As these three movements come in closer alignment, the movement for food justice encompasses demands for equitable food access and community health, food workers' rights and protections and the sustainable localization of the food system. The realization that systemic barriers prevent people from making healthier choices, in particular, has caught the attention of lawmakers at the local, state, and federal levels, including the White House. This acknowledgement has prompted a slew of new policy initiatives, many of which promise to be followed by new funding sources.

## **Beyond Just Something I Eat: Why a "Food System?"**

To build towards true sustainability, it is crucial to look at food as a system and understand its entire life cycle beyond the moments when we commonly encounter food in our homes, schools, grocery stores and restaurants. The conventional food system is currently characterized by distance and disconnection; the community-based food system model seeks to integrate and connect people, places, resources, and communities involved in food.

Without looking at food systemically, we risk crafting solutions that are only partially effective, or may exacerbate other problems at different points in the food cycle. For instance, increasing the use of food stamp

benefits at farmers' markets is an important step in ensuring access to healthier foods for those most in need. However, outside a larger strategy of improving wages for low-income families, unacceptable rates of hunger and food insecurity will continue unchallenged, perpetuating the need for food stamps. The goal of a community food system is to maximize sustainable outcomes in every way—environmental, social, and economic—to make long-lasting and consistent change throughout the food system.

This report examines five major sectors of the food system in order to offer a holistic picture of the challenges and opportunities at each stage of the supply chain and highlight systemic, integrated solutions. The five sectors examined are production, processing, distribution, retail, and waste. Together they constitute a whole system in which impacts at each link in the chain resonate throughout the entire system.<sup>22</sup> Each comes with its own challenges and opportunities for sustainable economic development and green job creation. Understanding the basics of how the food system works helps us grasp the interconnectivity among sectors, answering fundamental questions about how we got here and how we can get out.



# FOOD SYSTEM OVERVIEW

## THE FOOD SYSTEM SUPPLY CHAIN

### Food System Overview—The Food System Supply Chain

**Production** entails the growing or raising of food in fields, orchards, ranches, farms, or fisheries. This includes products consumed fresh such as fruits and vegetables, and raw materials for processed foods such as corn, wheat, and soy.

**Processing** is the preparation of raw foodstuffs into consumable products. This includes butchering, cleaning, and packaging of meats, fish, and poultry; milling grains; pressing oils; and preparation and packaging of value-added goods such as canned, dried, pickled, frozen, or otherwise preserved foods.

**Distribution** is the storage and delivery system by which food moves from farm or processing facility to consumer markets, typically via warehouse facilities that supply products wholesale. Food is transported by trucks, ships, trains, and airplanes.

**Retail** is the outlet where food is marketed and sold for consumption. Food retail is typically divided into two main categories: grocery (supermarkets, corner stores, etc.) and food service (restaurants and cafeterias).

**Waste** includes food or food byproducts that are discarded or recycled. Food waste in this context includes edible foods that go uneaten due to surplus, perishability, or because they are unmarketable, as well as food scraps from household or restaurant preparation. Byproducts of food production, processing, and distribution are also considered food system waste.

### The Structure of This Report

This report provides an initial exploration of the types of businesses and occupations found in a sustainable food economy. It does not capture hard datasets on “green” food businesses and jobs, but rather gathers intelligence on emerging approaches to food-related economic development and their implications for the world of work opportunities. This preliminary assessment is intended to plant seeds for future research.

This report devotes a chapter to each sector and sketches a broad picture of the current state of the environment, economy, and equity for each. It outlines emerging green trends, explores the impact of greening on the world of work, and offers case studies to highlight sustainable businesses blazing new pathways toward a sustainable food system.

Sustainable and socially conscious food businesses have been around for many decades. However, economies of scale among food enterprises that strive for robust “triple bottom line” outcomes that are environmentally harmonious, economically sound and socially just are still nascent. As such, not every company or occupation discussed here embodies the full vision of a sustainable food system. For example, several of the companies

and business models studied are relatively new and cannot yet promise a secure career path or even numerous employment opportunities. But this report highlights them for their commitment to holistic green practices, their potential for growth and their contribution to direct and indirect benefits beyond wage employment, such as improved access to healthy food.

Following the sector-by-sector analysis is a brief look at government policies and programs at the federal, state, and local level that leverage their respective authority to stimulate sustainable food-related economic development to address many of the challenges facing communities at the local level. We conclude with some next steps for community advocates and practitioners to build capacity for grassroots community development activities and connect local innovation to a broader movement for policy reform.

## **Methodology**

For a snapshot of the size and dominant trends in each sector, we relied on data from the US Bureau of Labor Statistics, the US Economic Census, the USDA's Census of Agriculture and other published sector-specific research. To identify emerging green trends among food business, we aggregated available literature, interviewed experts and collected information on nearly 100 companies across the country in all five sectors that aligned with the triple-bottom line definition of "green" outlined in the Introduction.

Interviews were conducted with 35 of these companies to vet initial findings and learn more about their business models. Business owners and managers were asked about the size, structure and history of their company and about their suppliers and customers. We also inquired about the nature of work in their company to understand how green practices are shaping workforce needs, and sought to identify if green practices result in (1) an increase in demand for existing positions with skills remaining largely the same, (2) a need for new skills in existing positions, or (3) the creation of entirely new positions unique to a green practice or trend. We found that work in sustainable food also includes a fourth category - revived occupations. The transformation to more sustainable practices requires the revival of traditional food preparation or processing techniques in use before industrial methods became the status quo. Ironically, the required skills for a more sustainable food system involve relearning seemingly antiquated practices rather than just innovating entirely new skills. The report's findings and analysis regarding impacts on specific occupations are seen in the Green Jobs Matrices in Appendix B.



## FOOD SYSTEM OVERVIEW

### A. FOOD PRODUCTION TODAY

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**Economics.** Food production entails the growing or raising of food in fields, orchards, ranches, farms, or fisheries. This includes both products consumed fresh such as fruits and vegetables, and raw materials for processed foods such as corn, wheat, and soy. Agriculture in the United States is a nearly \$300 billion dollar<sup>24</sup> industry which employs 737,000 workers<sup>25</sup> on more than 2.2 million farms,<sup>26</sup> figures that do not account for the 260,000 mostly migrant seasonal workers employed through fee-for-service contracts. The industry is increasingly concentrated with less than 10 percent of farms generating more than three-quarters of US industry sales.<sup>27</sup> However, 91 percent of American farms are small and family-owned and rely heavily on direct sales to consumers.<sup>28</sup>

**Equity and Labor.** The people who produce our food face some of the worst working conditions and labor in some of the lowest paying occupations in the country. In California, the largest agricultural state in the nation, seventy-five percent of farm workers earn \$15,000 a year or less.<sup>29</sup> Long hours, lack of health care or quality housing, exposure to pesticides and extreme elements, and wage theft are only some of the many hardships endured by farm workers. These conditions are compounded by the fact that many farm workers are less likely to seek or receive legal aid and social services due to their immigration status. Since the late 1990's, there have been thirteen federal cases of slavery exposed across the country where contractors forced migrant farm laborers to work without pay under threat of violence and deportation.<sup>30</sup>

Additionally, rampant and longstanding discrimination in lending against Black, Native American and other minority farmers at the USDA has resulted in billions of dollars of settlement in 2010.<sup>31</sup> In 2007, the average loan to African American farmers by the USDA was \$28,408, which is 32 percent of national average. The average loan to white farmers was \$88,379.<sup>32</sup>

**Environment.** The period after World War II saw a dramatic shift in food production in the US. The availability of cheap fossil fuels and rapid technology advances led to the rise of mechanized and single-crop (or “mono-crop”) farming on a large scale. Today, the cost of industrial agriculture is seen in the long-term environmental health impacts.

Agriculture is a major contributor to climate change. Compared to other food sectors in the US, agriculture is responsible for 60 percent

#### Unions in the Food System

To achieve true equity in the food system, worker justice and fair labor practices need to be at the center of a sustainable food system agenda. Organized labor is on the frontlines of fighting for workers' rights and protections and represents hundreds of thousands of workers in the food system.

*The following unions represent the largest numbers of food system workers:*

- **United Farm Workers (UFW)** represents farm workers.
- **United Food and Commercial Workers (UFCW)** represents workers in grocery stores, supermarkets, meatpacking and poultry facilities, and food processing plants.
- **UNITE HERE** represents food service workers in restaurants, hotels, and cafeterias.
- **International Brotherhood of Teamsters (IBT)** represents warehouse workers in food processing and bakeries, truck drivers for food distributors, wholesalers and processors, and waste management workers.

of all greenhouse gas (GHG) emissions.<sup>34</sup> On its own, agriculture makes up 6 percent of total GHG emissions nationally.<sup>35</sup> Additionally, 80 percent of water drawn from freshwater sources goes toward agricultural use.<sup>36</sup> Large, mechanized farms rely on nonrenewable petrochemical inputs such as diesel fuel and synthetic fertilizers, and the use of pesticides, tilling and monocropping result in soil degradation and water pollution from agricultural runoff. These issues are further compounded by deforestation from expanded crop and livestock production.

The diversity of our diets has suffered as well. Today, 46 percent of all agricultural sales are made up of three commodity categories—(1) cattle, (2) corn, and (3) poultry and eggs—while vegetables comprise less than 4 percent of agricultural sales.<sup>38</sup> The number of acres dedicated to corn versus other vegetable production also speaks to the why the average American diet is inundated with corn fed or derived ingredients: 86.3 million acres of US farm land is dedicated to corn versus 4.4 million (5 percent) acres for all other vegetables.<sup>39</sup>

## Sustainable and Just Production: Market Trends for A New Food Economy

### Organic Means More Jobs

Concern over the ecological and health impacts of industrial agriculture has opened a significant market for more sustainable food producers. Organic farming in particular has seen enormous growth over the last 20 years and continues to outpace sales growth of non-organic food. According to the Organic Trade Association, organic food sales in 2009 reached \$28.4 billion, a 5.1 percent increase from the year before, while total US food sales grew only by 1.6 percent.<sup>40</sup> This trend is promising in terms of job opportunities. Farming techniques used on organic farms like intercropping, crop rotation, natural pest management and composting are difficult to mechanize and therefore require more labor. Though the job creation potential of organic has yet to be fully explored and understood in the US, several international studies indicate organic farming is indeed a job generator. For example, Soil Association of Britain found that organic farms create 32 percent more jobs per farm than equivalent non-organic farms.<sup>41</sup>

## Unions in the Food System

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- **International Longshore and Warehouse Union (ILWU)** represents shipyard and port workers who deal with the movement of goods, including food imports.
- **Service Employees International Union (SEIU)** represent food service workers in hospitals.

*Other unions who interface with the food system include:*

- **American Federation of State, County and Municipal Employees (AFSCME)** represents food service workers in the public sector or government workers who deal with food service contracts.
- **American Federation of Teachers** and other teachers unions represent food service workers in schools and teachers and other school personnel who can be linked to school food programs.
- **International Chemical Workers Union (a Council of the UFCW)** represents workers in some food manufacturing sectors including prepared meats, coffee, baking powder and cake mixes.

In addition to unions, worker centers like **Restaurant Opportunities Centers United** and alliances like the **Food Chain Workers Alliance** organize food system workers and allies to fight for better protections and pay.

Some of these unions have spearheaded forward-thinking efforts to expand sustainability in the food system. However, very rarely do unions collaborate across sectors to initiate broad transformation of the food system, or make the connection to other food system workers. A coordinated strategy among workers across the food chain workers could serve to strengthen the respective struggles. As the sustainable food movement gains steam in the policy arena, labor standards are often left out of the dialogue. Workers' voices must be at the table to ensure workplace justice is integrated into notions of sustainability in policies and practices moving forward.

### Fair Food: The Struggle Continues

Yet, the “organic” title alone is hardly an indication of improved conditions for workers, especially as USDA organic certification does not account for labor standards. Ironically, the high cost of certification has allowed major food companies like General Mills, Heinz, and Cargill, to name a few, to dominate the organics market.<sup>42</sup> Minimum wage violations, heavy-handed management and sexual discrimination have emerged at several large organic grower operations.<sup>43</sup> Part of the problem is that the price premium for organic products compels many farmers to convert to organic with no motivation around improved environmental or labor practices.<sup>44</sup> One survey of organic growers in California found that 67 percent felt that adding social criteria to organic certification would be an “unacceptable financial burden.”<sup>45</sup>

### Urban Agriculture: A Model for Holistic Community Development

As the organic food movement brought attention to the environmental and health impacts of industrial farming, sustainable food advocates are now scrutinizing more closely the disconnect between how and where our food is grown and who has access to fresh food. Community gardens, urban farms and edible landscapes are sprouting up in cities across the country as a way to reconnect communities with healthy food. While food production in cities has not yet proven to be a large or consistent job growth area, and there are many challenges to bringing urban farming to scale, the powerful multiplier effect of urban farming reveals benefits beyond wage employment. Community gardens and city farms are public gathering spaces that expand equitable access to fresh food and promote skills in healthy eating, wellness and self-reliance through growing one’s own produce. The Massachusetts Ave Project (MAP) in Buffalo, NY, combines urban agriculture training for young people with a leadership and life skills program. Through hands-on growing experience, awareness of nutrition and the food system, and social entrepreneurship training, the Growing Green project of MAP hopes to inspire young people to be social change agents in their communities.

Consistent access to urban farming can supplement a family’s food budget by \$500 to \$1200 worth of produce annually since most produce from urban

## INTERNATIONAL AND DOMESTIC FAIR TRADE: Toward Certification of Fair Labor in Agriculture

Over the past thirty years, public concern about the damaging effects of free trade agreements for indigenous and *campesino* agricultural workers in Global South countries opened a niche market for certified Fair Trade food products. Several fair trade labels exist to certify that a product was cultivated and distributed according to a variety of social and environmental criteria including a fair price for producers, equitable access to markets, collective bargaining rights and the absence of forced or child labor. Fair Trade indicates a relationship between producers, sellers and consumers that is based in equity, respect and transparency.

Despite the growing popularity of fair trade labeling for international products, consumers have had little way of knowing the conditions facing farm workers behind products produced in the US Beginning in the 1970’s, the United Farm Workers shed light on the exploitation of farm workers through worker organizing and national boycott campaigns, a tradition continued through the efforts of tomato pickers from Florida’s Coalition of Immokalee Workers and other farm worker organizations.

In 2007, the Domestic Fair Trade Association convened an alliance of business and non-profit stakeholders representing farmers, farm workers, retailers, processors and other food system workers to begin to make sense of the variety of emerging domestic fair trade labels. The Association worked to translate the traditional principles of international fair trade. The mission of the Alliance is to promote and protect the integrity of these standards through “education, marketing, advocacy and endorsement.” In terms of endorsement, the Association is currently working on an evaluation of domestic fair trade label claims to help consumers understand what labels actually mean, which will be due out early 2011. The fourteen guiding principles used by the Association are: family-scale farming, capacity building for producers and workers, democratic & participatory ownership & control, rights of labor, equality & opportunity, direct trade, fair & stable pricing, shared risk & affordable credit, long-term trade relationships, sustainable agriculture, appropriate technology, indigenous peoples’ rights, transparency & accountability, education & advocacy.

gardens is consumed at home by the gardeners themselves and their relatives and neighbors.<sup>46</sup> Safe, green places to recreate and skill share are also important anchors for community economic development and benefit property values in surrounding neighborhoods. Gardens are also places where city dwellers can explore the natural cycles of life, which can be therapeutic and help decrease crime.

## **IN THE SPOTLIGHT: Companies Paving The Way**

### **Swanton Berry Farms**

To this day, Swanton Berry Farms near Santa Cruz, CA, is the only union-contract organic farm in the country. Owner Jim Cochran employs a crew of 35 full-time workers who farm a variety of berries on 200 acres of leased land in five locations near Santa Cruz. Cochran has been a vocal advocate for unionized farm labor. “The existence of a union contract formalizes our commitment to the human side of the farming equation, much as the process of organic certification formalizes our commitment to a set of farming practices,” explains Cochran. The union contract provides a comprehensive package of benefits, including a low-cost housing option that 75 percent of the workers use. Unlike most rural farm work, employment at Swanton Berry Farm provides a diversity of farm labor experience and career advancement. “The union contract has an important psychological effect on farm workers. They begin to see themselves as professionals, rather than as ‘cogs’ in a system,” Cochran notes.<sup>52</sup>

### **Sweet Water Organics**

Sweet Water Organics began in 2008 as an organic commercial aquaponic operation in an old retrofitted industrial warehouse in Milwaukee, WI. Co-founders James Godsil and Josh Fraundorf sought to scale up the now-famous aquaponic model developed by MacArthur Genius grantee Will Allen at Growing Power (see Appendix C for a description of Growing Power). The three-tiered, bio-intensive production system creates a safe and sustainable way to raise fish and grow organic vegetables where fish waste serves as a natural fertilizer and the plant bodies cleanse and filter the water. The company sells a variety of greens, tomatoes, watercress, peppers and fresh perch to “iconic” local restaurants and natural food stores, and has an additional revenue stream from a contract with a regional supermarket to compost their food waste and sell the organic grade compost at the grocery stores. Key partnerships have played a major role in the successful launch of Sweet Water Organics. In particular, a partnership with the University of Wisconsin–Milwaukee Great Lakes WATER Institute supplied the company’s first 25,000 perch. The Institute and the company share a Memorandum of Understanding that will help the Institute commercialize new technology at no cost to the company.

## **Controversial Alchemy: Turning Food Crops Into Fuel**

The urgent need for increased energy independence and renewable energy sources has generated much excitement for the cultivation of “agro-fuels” such as ethanol derived from corn. Similarly, biomass farming is also a means of using the heat of composting agricultural crop volumes to generate energy.<sup>48</sup> President Obama has announced that energy crops will be an important part of his climate change abatement strategy.<sup>49</sup> However, environmentalists have raised concerns about using food crops for fuel, including the environmental damage of pesticide use, topsoil destruction and water contamination from intensive mono-cropping.<sup>50</sup> The production and processing of agro-fuels is an energy-intensive process that could negate the overall goal of reducing energy consumption and greenhouse gas emissions.<sup>51</sup> From a food security perspective, growing food for fuel does not eliminate hunger or ensure worker and consumer rights and could increase food prices. However, as advanced bio-fuel technologies commercialize and come to scale—such as growing algae to generate fuel—they will address some of these concerns. Advanced bio-fuels, if done right, are less reliant on land use, generally consume less energy and water, and emit lower levels of greenhouse gases.

## **THE WORLD OF WORK: Green-Collar Jobs for Sustainable Food Production**

### **Uplifting Labor**

If food production is to grow as a viable site of good, green jobs, occupational farm labor will need to transition from a mostly exploitative, dead-end job into a meaningful career. Workers need to be provided a living wage, health care, off-season employment opportunities and be treated with dignity.<sup>53</sup> Including social and economic criteria into organic certification or strengthening the market power of domestic fair trade certifications could lift labor standards in a way that honors the skill and professionalism of one of the world's oldest and most needed occupations.

### **Evolving Knowledge, Skills and Abilities**

A skilled and knowledgeable workforce will be necessary for the transition away from fossil fuel dependent agriculture. Sustainable farms tend to need more workers overall and require workers to perform more tasks. Instead of rote picking alone, farm labor in sustainable operations can gain aptitude in integrated pest management, plant health, multi-species husbandry, soil management, habitat maintenance, landscape design, seed saving and crop rotation. While entry level work in farming will likely continue to have very low barriers to entry, sustainable agriculture could offer better opportunities for career growth in agro-ecology, permaculture or other environmentally sound farming methods. For example, aquaponics facilities require a wide breadth of expertise from construction to sales to bio-chemistry, which indicates career advancement. Farm skills may also translate well into employment with landscape companies, greenhouse nurseries or even food retail, as evidenced by several urban agricultural job-training programs.<sup>54</sup>

### **Advancing Technology**

Looking ahead, facility with emerging “green” technologies in food production may be valuable for agricultural workers seeking occupational advancement. Advances in geospatial, aquaponic and other technologies that enable farming in high-density or sensitive landscapes require specialized skills and training. Food production in a dense urban landscape requires specialized methods and tools like sub-irrigated planters, rainwater catchments, precision composting, hydroponic, aquaponic<sup>55</sup> and vertical growing. These methods require technological aptitudes and facility with architecture and engineering to achieve scale.<sup>56</sup> Generally, the effect of “greening” food production requires farmers, agricultural technicians and laborers to skill up.



## FOOD SYSTEM OVERVIEW

### B. FOOD PROCESSING TODAY

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**Economics.** Food manufacturing is the sector that converts raw agricultural ingredients into “value-added” food products such as breads, cheeses, tortillas, snacks, pasta, seasonings, sauces, deserts and prepared food. Manufacturing of food products in the US is a \$589.5 billion dollar industry<sup>57</sup> that employed nearly 1.5 million people in 2008.<sup>58</sup> While overall jobs in manufacturing have dramatically declined since the beginning of the Great Recession in 2008, food manufacturing has experienced a steady incline. Food manufacturing jobs are projected to grow by 4 percent in the next decade.<sup>59</sup>

**Equity and Labor.** Despite its critical role in the US economy, the industry has one of the highest incidences of injury and illness in the nation. Labor standards are particularly egregious at meat packing plants, where “systematic human rights violations” such as the failure to use known injury prevention methods persist.<sup>60</sup> Over half of those employed in food processing—more than 800,000 people—are production workers such as bakers, slaughterers and butchers, food batch makers and cooking machine operators.<sup>61</sup> The sector employs notably large numbers of foreign-born workers and, in some cases, offers living wage opportunities to workers with no formal education or training, making it a strategic target for community advocates. In industry nodes like New York City, Chicago and Los Angeles, production workers earn an average of \$33,000 a year.<sup>62</sup> In terms of public health impacts, consumption of highly processed food rich in sodium, trans fats and saturated fats, refined sugars and preservatives has contributed to higher levels of nutrition-related disease, especially in low-income and communities of color.<sup>63</sup>

**Environment.** Food processing requires energy and water use for cleaning, sorting, cooking, cold storage, packaging and waste disposal. This sector accounts for an estimated 16 percent of energy expended in the food system<sup>64</sup> and about 10 percent of the food system’s greenhouse gas emissions.<sup>65</sup> Between 1997 and 2002, the food processing sector’s energy use outpaced all other food-related sectors.<sup>66</sup> This trend is likely driven by demographic and lifestyle shifts and related changes to household consumption patterns. People work longer hours and have less time to prepare food at home, leading to an increased reliance on ready-to-eat and pre-cut foods.<sup>67</sup> Packaging alone is estimated to consume 7 percent of energy use in the food system<sup>68</sup> and make up the largest portion of municipal solid waste, approximately 31 percent.<sup>69</sup>

Food safety is a major concern for processors and distributors since the more elaborate the supply chain, the more vulnerable food is to contamination. The Food and Drug Administration (FDA) reports that an estimated 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths result every year from food-borne illness in the US.<sup>70</sup> Up until the passage of the Food Safety Modernization Act in January 2011, the limited regulatory powers of the USDA and FDA have been targeted as a part of the problem, as these agencies’ authority was limited to suggestion on many food safety practices. They could inspect and monitor for contamination, but were not able to enforce compliance on most prevention methods, and did not have the authority to mandate recalls of contaminated food.<sup>71</sup> The Food Safety Modernization Act addresses some of the concerns by expanding the FDA’s inspection and recall authority.

## Sustainable and Just Food Processing: Market Trends for A New Food Economy

### “More Than a Link:”<sup>73</sup> Food Processing’s Value-Add for Sustainability

The convenience of ready-to-eat processed foods is indispensable today for many busy people. Although processed food may not immediately conjure images of sustainable and healthy food system, food processing does offer the ability to extend the shelf life of fresh, sustainably grown foods, and therefore, allow wholesome foods to reach more markets and communities. Instead of shipping produce across continents during the off-season, locally grown produce can be canned, dried, pickled, preserved or blended into value-added food products for longer shelf life.<sup>74</sup> While admittedly not representative of food processing generally, which tends to manufacture complex food products with “filler” ingredients that deplete a product’s nutritional value, technologies such as canning and jamming previously thought to be “old fashioned” are rising in popularity as communities grow and preserve their own foods. Events like the Eat Real Festival in Oakland, California are reviving artisanal food processing with classes on butchery, brewing, cheese-making and other forms of “food craft.”<sup>75</sup>

More elaborate food processing also has a role in a sustainable food system. Food processing allows us to localize the food system beyond just fruits and vegetables, which are often the focus of community-based food initiatives. The “buy local” movement continues to bolster the sales of locally-produced breads, dairy products, meats, salsas, soups and health-oriented specialty items, demonstrating the possibility for a sustainable food system that encompasses everything we eat, not just produce. The technologies for the manufacture and packaging of food could be a “value add” for a sustainable food system. However, this infrastructure needs to be better connected to sustainable and urban growers, local food businesses and health conscious yet busy consumers.

### Food Processing for The Little Guy

While demand for locally grown and raised food takes off, processing and distribution capacity remains mostly out of reach for small, sustainable producers. Small, flexible processing facilities are needed to meet the needs of small farmers and urban growers. For urban communities seeking to produce their own food, small food processing facilities are essential to financially sustain urban agriculture through the commercial manufacture of “value-added” food products.

### Tools for Community Entrepreneurship: Incubators & Co-packers

Kitchen incubators and co-packing operations are examples of accessible processing facilities, and serve as important vehicles for cultivating sustainable food enterprise in both rural and urban areas. A kitchen incubator offers farmers, cooperatives, start-ups and existing food companies affordable commercial manufacturing space and access to new technology, research, workforce development, capital and legal aid. In essence, they “incubate” new or evolving food businesses. Incubator facilities have the potential to make a powerful impact on the local food economy that should not be underestimated. The Rutgers Food Innovation Center in New Jersey estimates that its service and facility offerings have generated 1,000 new net jobs in the regional economy and over \$200 million in cumulative new revenue for its clients since opening its 23,000 square foot facility in 2000.<sup>78</sup>

## At Home in the City:

### The Importance of Urban Food Manufacturing

Food manufacturing companies tend to thrive in cities where they have easy access to distribution and retail networks.<sup>80</sup> Food processors located outside of cities often rely on national distributors and face increased transportation costs. Urban clusters help reduce the number of miles food travels and reduce the carbon footprint of food, especially if raw ingredients are sourced within the region. Urban food processing is also a significant local economic driver. A 2003 study of food manufacturing in New York City found that the sector spent \$1.3 billion on goods and services rendered *within* New York City, with 84 percent of food manufacturers buying produce from New York City-based companies.<sup>81</sup> Sixty-four percent of the food processed in New York City was also consumed locally. As fuel and transportation costs rise, urban clusters offer food manufacturers a competitive advantage and a lower barrier to entry for start-up companies.

While incubators nurture a developing food enterprise, a co-packer is a longer-term strategic business ally. The capital requirements for equipment and certified facilities can be prohibitive for the entrepreneur who wants to transform her family's chili recipe into a retail-ready product.<sup>82</sup> A contract packer or "co-packer" manufactures and packages food products for food entrepreneurs who lack their own commercial manufacturing capabilities. Co-packers can also play an important role in extending the availability of locally grown food year round.<sup>83</sup> Through packaging, freezing and preserving with a co-packer, growers can extend the life of their produce, reach larger markets and spread their livelihoods beyond the harvest season, which also allows them to keep workers employed throughout the year.<sup>84</sup>

### **Going Green Through Facility Improvements**

Sustainability efforts do not just include locally grown and processed goods but also green processes adopted in the manufacturing operation. Many food manufacturers are making an effort to reduce water and energy waste by re-engineering their processes or replacing antiquated machinery.<sup>85</sup> Larger manufacturers are also re-designing their packaging with biodegradable or recyclable material, and educating their suppliers about more sustainable agriculture and postharvest handling techniques.<sup>86</sup> Innovations in energy efficient technologies and increasing financial incentives for industrial retrofits can help food processors decrease their operational carbon footprint.

## **IN THE SPOTLIGHT: Companies Paving the Way**

### **EcoFriendly Foods**

Founded in 2001 by Bev and Janelle Eggleston in Southwest Virginia, EcoFriendly Foods is the only multi-species, USDA and humane certified slaughterhouse in the country. In testimony in front of Congressional Domestic Policy Subcommittee in March 2010, Bev Eggleston said "this directly stimulates rural economic development, because our plant makes the business of raising livestock on a small-scale economically viable for Virginia farmers who otherwise would not be able to be profitable, [which also] enhances agricultural diversity." The company's staff of eight is trained in every aspect of animal care, slaughtering, cutting, retail-appropriate packaging and documentation. The rotation of tasks eliminates occupational health problems like tendonitis, common among workers in conventional meat packing facilities where tasks are more rote. Despite struggling toward profitability, EcoFriendly Foods is currently hiring a sales associate for the Washington, D.C. Farmer's Market and has plans for a second facility in upstate New York within a year.

### **Sweet Beginnings LLC**

Sweet Beginnings is an urban apiary and natural cosmetic company in Chicago, IL, that offers transitional employment to formerly incarcerated individuals and others with significant barriers to employment. A social enterprise owned by the non-profit North Lawndale Employment Network, Sweet Beginnings employs up to 100 people for a period of 3 to 12 months. Employees are trained in every aspect of the company, including beekeeping, honey harvesting, manufacturing beeline® products, shipping and receiving, inventory management, customer service and quality control, while also receiving case management services and career counseling. Skills acquired at Sweet Beginnings LLC easily parlay into full-time employment in other manufacturing sectors, retail/customer service, physical plant services, quality control and landscaping. The company claims an exceptionally low recidivism rate of 4 percent compared to the national average of 65 percent for other similar programs.

## **THE WORLD OF WORK: Green-Collar Jobs for Sustainable Food Processing**

### **Uplifting Labor**

Meat production and processing in particular is highly energy intensive and dangerous work, and still the most

labor-intensive work within food manufacturing. Humane slaughterhouses and packinghouses available to small and sustainable ranchers are a necessary but still lacking component of a healthy food system. As this sub-sector begins to transform into a more sustainable one, labor standards need to be established through worker organizing and collective bargaining agreements. The pace of work in meatpacking needs to slow and workers need to be trained and rotated through a variety of skilled work to avoid injuries. The emergence of smaller slaughterhouses and artisanal meat craft has the potential to revive butchery as a respected career. High-end restaurants are looking to butcher shops like New York City's Marlow and Daughters to maintain high standards of butchery as a skilled craft.<sup>89</sup> The growing demand for sustainably raised meat could lead to more distinguished career trajectories.

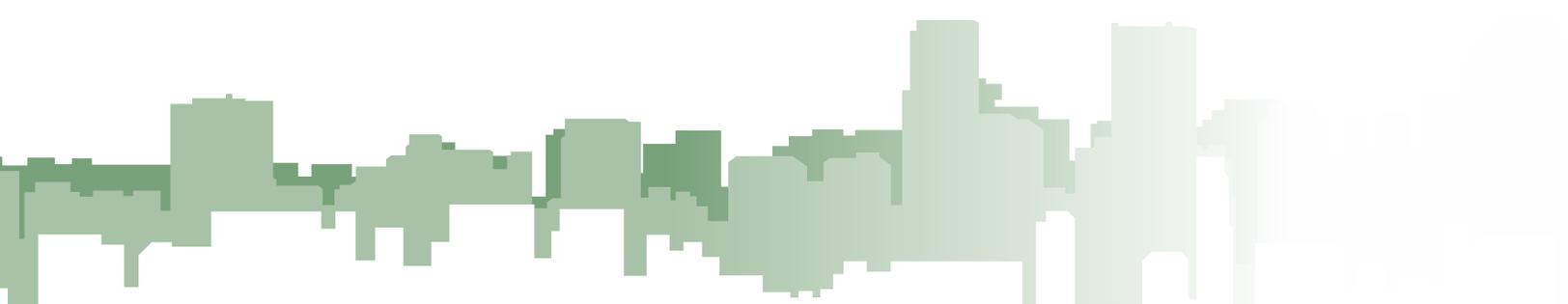
### **Evolving Knowledge, Skills, and Abilities**

From the renaissance of traditional micro-processing on a community scale to the retrofit of facilities to reduce energy consumption on an industry scale, job and career opportunities in food processing continue to grow. While the techniques and aptitudes associated with food manufacturing work such as baking, batch making, and meat cutting remain largely the same overall, shifts toward more sustainable practices change the kind of ingredients, industrial machinery and manufacturing processes with which workers need to be familiar.

Sustainable food manufacturers increasingly need research, data and training on innovations in food science that prioritize the safety and health of workers, consumers and the environment. As it is, food science and technology occupations are on the rise, working in ingredient development and testing, quality control, and environmental testing and inspection of facilities to prevent contamination. The incorporation of new or traditional sustainable food growing and processing practices has already raised questions about food safety. How will small growers and processors trace and verify the safety of their ingredients? How can sustainable food processors maximize shelf life and avoid contamination without the use of preservatives or other unnatural ingredients? Workers skilled in food science and technology, culinary arts and nutrition will be able to work on these questions as food processors become a more active part of a sustainable and community-centered food system.

### **Green Facilities and Operations**

The "greening" of food processing also requires more energy efficient and water saving technologies for post-harvest handling including washing, freezing, cooling, ripening, dehydration or other storage methods. A working knowledge of building science and facilities operations, water conservation and energy efficiency, and plant and agricultural science are needed to develop more environmentally sensitive operations. Individuals with a background in the skilled construction trades and industrial machinery can lend their expertise to the greening of food processing. Additionally, experience in packaging design and manufacture will be necessary to integrate sustainably derived and bio-degradable materials and reduce overall packaging waste.



## FOOD SYSTEM OVERVIEW

# FOOD DISTRIBUTION TODAY

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**The Economics.** Wholesale food distribution is the sector responsible for moving food through the food system, either from producers to processors, from processors to retailer, or from producer to retailer in the case of directly consumable farm products like fresh produce. Distribution involves warehousing, refrigeration, storage, logistics coordination, and, of course, transportation. Distribution is the key infrastructural link without which most suppliers could not be able to sell their products on the market. What is known as grocery wholesaling is a \$670 billion industry that employs over 779,000 workers.<sup>90</sup> Refrigerated warehousing and storage includes another \$3.4 billion and employs 42,000 workers.<sup>91</sup> The distribution of farm goods headed for processing rather than directly to retail markets adds an additional \$146 billion and 61,000 workers.<sup>92</sup> Altogether these main activities comprise an approximately \$819.4 billion food distribution sector employing 882,000 workers. These numbers do not necessarily include all transport involved in distribution (truck, rail, boat, or air), as freight figures for food products are aggregated with other goods and difficult to determine. Despite its high sales figures, distribution requires a smaller workforce relative to other food sectors due to mechanization and advances in food handling technology.

**Equity and Labor.** Jobs in food distribution range from white collar office work in administration, purchasing, sales and marketing, to blue collar occupations including warehouse workers, forklift operators, sorters/packers, and truck drivers. Working conditions for warehouse workers vary depending on location, employer, and union membership. Many transportation and cold storage warehouse workers of mainline grocery stores such as Albertson and Vons are unionized with the Teamsters and have secured benefits, regular pay increases, and regulated working conditions. However, non-union workers at companies like Wal-Mart, the largest food retailer in the world with its own massive distribution network, endure low wages, injurious conditions, and limited benefits. Hiring workers as temporary employees is a widespread practice that leaves workers with no benefits or job security.<sup>93</sup> These lowered standards threaten standards across the industry as these mega-retailers' market share expands. In major US distribution hubs, such as Chicago and the Inland Empire area of Southern California where these large distributor-retailers operate massive warehouses, workers are struggling to unionize to improve conditions and combat poverty.<sup>94</sup>

**The Environment.** Food distribution involves large energy and fuel inputs, particularly for transport and powering refrigeration and warehouse technology. Highly perishable items such as fresh produce, meats, poultry, fish, and dairy require larger inputs for refrigerated transport and storage than processed and preserved food products. While the consolidation of both production and retail have centralized distribution systems and streamlined logistics for large distributor-retailers, inefficiencies abound in the form of excess transport. Typical distribution to major retailers such as chain grocery stores and restaurants now moves from farm or processing facility to a central distribution center (CDC) and then to a regional distribution center (RDC) to the store. Depending on the region, food is sometimes transported through the distribution network up to three times farther than if it went straight from farm to store.<sup>95</sup>

## **Sustainable and Just Distribution: Market Trends for A New Food Economy**

### **“Is Local the New Organic?”**

Time Magazine prominently displayed this inquiry on the cover of a 2007 issue, drawing attention to the growing popularity of locally-grown food. The idea that true sustainability means localized food production is taking hold in the face of rising social, economic, and environmental costs of long-distance transport. The trend towards “local” has also renewed interest in supporting small- and mid-sized family farms that disappeared by the millions over the last half-century.<sup>98</sup> Demand for local foods has steadily increased through consumer and retailer education efforts, and has influenced natural food stores and even many conventional grocery chains such as Wegman’s and Wal-Mart to develop local food lines. Smaller organic produce distributors in the business of supporting sustainable agriculture are incorporating local product lines as well, working with retailers on how best to market local products and engaging consumers to support their regional farmers.

### **Paving New Distribution Pathways: Grower Collaboratives**

Lack of infrastructure that can link production and consumption sites on local and regional scales is often a key barrier to getting more locally produced food into markets, particularly for small- and mid-sized farmers that may struggle to provide steady supply and lack the capacity, capital, and infrastructure to do their own delivery to retailers.<sup>99</sup> To overcome these barriers, farmers and food system advocates have sought to increase direct sales, while strategizing around all-new alternative distribution networks such as grower cooperatives and regional food hubs that exclusively move local product.

In grower collaboratives, producers pool resources and coordinate to develop warehousing, trucking, and logistics infrastructure to aggregate their products and bring them into local markets, effectively creating their own distribution networks. Many such initiatives begin as non-profit economic development projects seeking to fill infrastructure and marketing gaps for small farmers. Many grower collaboratives aggregate, brand and market products cooperatively, such as Wisconsin-based CROPP (Coulee Region Organic Produce Pool). Distributing to all 50 states and even some exports, CROPP has developed the popular brands Organic Valley (dairy, eggs, juice, and soy beverages) and Organic Prairie (premium organic meats), and boasts 1,652 organic, sustainable family farm members.<sup>101</sup>

### **Roots of a New Food System: The Regional Food Hub Concept**

Currently in the research and feasibility stages across the country, regional food hubs take distribution linkages a step beyond grower collaboratives by fulfilling other strategic functions of an emergent regional food system. A regional food hub is essentially an aggregation and distribution center that includes a communications center that coordinates the logistics of product movement. Although the physical needs may closely resemble existing distribution warehouses, unique will be the exclusive focus on regional and local products, the ability to aggregate orders from various sources to meet market demands, and features that accommodate smaller regional growers. Different cities and regions are strategizing how to build out a food hub model that best meets their needs. Most envision one or several strategically located warehouses where local farmers can drop products to be stored, aggregated, and distributed to local markets. Hubs have the potential to become an engine for a regional food economy by simultaneously supporting increased production, opportunities for local processing, infrastructure for local distribution, and demand through marketing, outreach, and capacity building.

### **Farm-to-Institution Distribution Programs**

Much of the strategizing around new infrastructure emerged from research on farm-to-institution programs that identified logistical and price barriers to increasing fresh, local foods in school and hospital meals. With proper infrastructure, institutions can source directly from farms, provided they can make the necessary arrangements for purchasing, delivery, and have trained staff and equipment to prepare the fresh foods. Smaller scale produce distributors in particular can provide expertise, communications technology, and relationships to make these programs successful. Regional food hubs would also be uniquely positioned to convene the necessary players and implement farm-to-institution programs on a larger scale.

## Greening Transportation

While localization and reducing food miles are fundamental to greening food distribution, even dynamic regional food economies with significant market share will inevitably rely on trucking to move products. Making transport more efficient is important not only for reducing GHG emissions (transportation makes up 11 percent of food system emissions in the US<sup>103</sup>), but also because of the impact of rising fuel prices on the price of food. Some distributors are opting to begin using advanced efficiency, hybrid, electric plug-in, and alternative fuel engine trucks to increase energy efficiency, and reduce costs and greenhouse gas emissions. While upgrading truck fleets may be out reach for smaller, slim margin food distribution companies, a number of federal, state and local incentives such as tax credits, vouchers, and financing opportunities are in place to make transitioning fleets economically feasible, subsidizing up to half of capital costs in some states. Fuel consumption and GHG emissions can be further reduced by training drivers in energy-smart practices and improving delivery routes to reduce miles traveled, particularly impactful initiatives when adopted by large fleets.

## Big Players Go Green: Corporate Sustainability Campaigns

As “green” grows in popularity and importance among consumers, some big retailers are building sustainability, energy efficiency, waste reduction, and local sourcing into their business plans, with many initiatives focused on distribution. In addition to ambitious improvements to product packaging standards and truck fleet efficiency, Wegman’s, an east coast grocery retailer, reduced its electricity consumption by 50 percent in distribution centers that serve its 77 regional stores by installing high-efficiency florescent lighting.<sup>105</sup> Wegman’s also boasts extensive long-term partnerships with local farmers who supply stores with locally grown produce.

On a much larger scale, mega-retailer Wal-Mart has announced plans to implement a local sourcing policy for produce in its stores, with specific targets for local procurement from small- and mid-sized growers.<sup>106</sup> This direction for one of the world’s largest grocery retailers attests to the market strength of local produce, and the industry giant has the buying power to significantly transform the production and distribution landscape with such a move. Participating growers will be required to fulfill Wal-Mart’s standards for “sustainability and efficiency” in their growing practices. While bringing local sourcing to scale would achieve meaningful GHG emission reductions, many are skeptical of Wal-Mart taking on the role of defining standards for sustainable agriculture. Concerns have surfaced over whether farmers will be worse off investing their own resources to upgrade practices and increase productivity to meet new standards required by Wal-Mart, having received no indication Wal-Mart will pay a premium for these new standards.<sup>107</sup>

## IN THE SPOTLIGHT: Companies Paving the Way

### Veritable Vegetable

Opened in 1974, San Francisco-based Veritable Vegetable is the nation’s oldest distributor of organic produce and an example of a successful high road employer dedicated to sustainable agriculture and fair labor practices. Its founders were active in the early organic foods movement of the 1970’s and started the company as a way to support the growth of organic farming by linking produce to markets. They now buy from 340 organic farmers and 300 organic produce distributors in California, New Mexico, Arizona, and Colorado. With \$30 million in annual sales and 108 employees total, 65 percent of staff (including owners, managers and hourly employees) are women.

Purchasing Manager Bu Nygrens, who started with the company nearly 30 years ago as a truck driver, says the company’s value-driven ethos continues to permeate the work environment. Entry-level wages are double the state minimum wage, and the company maintains a salary ratio of at least 5:1, meaning that the highest paid employee makes no more than 5 times the lowest paid. For perspective, in 2005 the average corporate ratio for US companies was 262:1.<sup>108</sup> Additionally, the company provides a range of top-notch benefits, and is committed to providing career pathways. The training and education department has three full time staff committed to employee development, conducting educational tours on farms and other events to build well-rounded employee literacy around sustainable agriculture and the products they sell. All new employees are required to

put in work hours in the warehouse regardless of their hired position, fostering an atmosphere of respect for the “heavy lifting” of produce distribution. In hiring new employees, Nygrens says the company’s policy is to “hire for aptitude, train for skill,” meaning that even if a prospective employee lacks training or experience, the company will hire those with the ability to learn and an enthusiasm for the company’s mission. Committed to fair labor practices not only in their internal operations but in the food system as a whole, they invested heavily in software upgrades to be able to track and market fair-trade imports they supply mainly on principle because it ensures fair wages for workers abroad.

### **Co-op Partners Warehouse**

Based in St. Paul, Minnesota, Co-op Partners Warehouse is a small, values-driven organic and natural foods distributor of produce, dairy, and other perishables to about 50 natural food cooperatives and some restaurants in several Midwestern states. Started in 1999, the warehouse was originally a project of the successful Wedge Co-op grocery store, which began leasing the warehouse for extra storage space and was also helping move products for other regional cooperatives. With their founding mission to “reclaim the food system” and support local sustainable producers by helping them reach markets, the warehouse even provides space for producers to store or repack product for which they have already arranged direct-sales with other markets, and will deliver the products in their own trucks for a freight fee.

The company is cooperatively owned and managed by its team of approximately 30 employees, who have living wages, health benefits, 401K plans with a 50 percent match, and profit sharing. Human resources are administered through the Wedge Co-op, which also offers employees up to 20 hours of payroll dollars for community service. Extensive cross training opportunities provide career pathways for entry level employees who may begin as dock receivers and become buyers if they show interest and aptitude. As of 2007 the Wedge Co-op now owns its own organic farm, from which it plans to produce its own organic product brand. With its own farm, distributor, and retail site, this cooperative consortium is modeling a system-wide approach to a regional food economy that supports farmers, workers, and the environment while bringing high quality, sustainably produced food to the communities they serve at affordable prices.

## **THE WORLD OF WORK: Green-Collar Jobs for Sustainable Food Distribution**

### **Evolving Knowledge, Skills and Abilities**

Whether moving local organic or distant-sourced conventional products, work in food distribution requires the skills of machine operators and mechanics, truck drivers, marketing and sales agents, customer service representatives, and office management. Many large and small companies now view educating their workforce as key to advancing their sustainability efforts and improving their effectiveness and profitability. Employers are building into their staff training and education programs knowledge of sustainable agriculture and environmental stewardship, and implementing green workplace initiatives such as recycling, composting, and energy efficiency. Additionally, knowledge of local food system issues and literacy in biodiversity and product species is increasingly required for purchasers and sales representatives in particular as new diversified products make it to market.

### **Logistics and Technology**

With the development of regional food hubs, expertise in handling, logistics coordination, and communications will ensure a continued role and relevance for food distributors in a green food system characterized by more local, direct relationships. For perishable foods in particular, services like demand forecasting and managing spot markets are key to moving products quickly and efficiently. As in food processing, food safety systems and technology in particular are continually evolving and require a workforce well-versed in all aspects of the supply chain, particularly for the development of contamination prevention systems that will inevitably favor more localized markets. Additionally, the creation of new communication systems to assist the development of sourcing and distribution networks among smaller growers and retailers through a food hub or other entity could generate demand for skills in communications technology and network systems development.

### **Increasing Employee Ownership**

Coop Partners Warehouse recently received a visit from a USDA representative interested in their business model as a cooperatively-run distributor that is flexible and mission-driven enough to serve the needs of local growers as they arise. Cooperative ownership in distribution companies is being looked to as a model that not only embraces high road labor practices but also fosters regional economic development. With grower collaboratives on the rise and regional food hubs in development, the hope is that opportunities for worker ownership will expand in budding regional food economies, creating an environment where labor is highly regarded and workers considered valuable assets. While cooperative models can be limited in their scalability, they can serve local needs and build community wealth. The increased job security and greater personal investment in a company's success that worker ownership provides tends to foster safer, more productive and positive workplace environments, and means a more equitable distribution of profits, keeping food system dollars in the communities that make the food system work.



## FOOD SYSTEM OVERVIEW

# FOOD RETAIL TODAY

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**Economics.** Taken as a whole, the food retail industry is one of the largest employers in the nation. Food stores, which include supermarkets, grocery and convenience stores, gross \$503 billion annually and employ 2.7 million people in the United States.<sup>109</sup> Food service places, including full-service dining, fast food, caterers and taco trucks generate approximately \$415 billion in annual sales and employ 9.2 million people.<sup>110</sup> Despite these figures, grocery stores and full service restaurants are hard to find in poor communities. The grocery industry has systematically abandoned low-income urban neighborhoods over the past several decades alongside “white flight” to suburban areas where land was cheaper and permitting easier.<sup>111</sup> Racism and perception of crime have perpetuated this gradual disinvestment. Additionally, large facility requirements help create tight profit margins for supermarkets, causing the grocery industry to prefer higher priced products and therefore a more affluent customer base.

**Equity and Labor.** Low barriers to entry-level jobs as a food preparation worker, server or cashier in the restaurant industry allow many immigrants and young people to find work, but employers trend toward low road practices like failure to provide health insurance or paid sick and vacation days. The federal minimum wage for tipped workers, which hovers at \$2.13 an hour (before tips), has not kept pace with the cost of living causing many restaurant workers to struggle with poverty.<sup>112</sup> Employment growth in the restaurant industry generally outpaces the national employment rate<sup>114</sup> reflecting a broader, national employment trend of growth in low-wage and unstable jobs.

Unlike the restaurant industry, grocery stores have traditionally provided family supporting wages, career opportunities, and high standards of professionalism. However, as union density in the industry has decreased as big box stores like Wal-Mart have edged into the grocery business, wages are dramatically declining.<sup>116</sup> Increased automation such as self-checkout stands, which nearly a quarter of grocery retailers now use, further degrades employment opportunities.<sup>117</sup> Overall employment in grocery stores is not expected to grow much in the next decade,<sup>118</sup> though a 4 percent increase is expected for cashier positions specifically.<sup>119</sup>

The trend in food retail has been for the grocery and restaurant industries to disinvest in low-income neighborhoods and communities of color throughout urban America. The term “food desert” has emerged to describe the way many working poor neighborhoods are inundated with fast food and convenience stores but generally lack grocery stores, sit down eateries or other food retail with quality and culturally relevant options. Even where grocery services exist, produce offerings in poor neighborhoods are often of worse quality yet higher priced compared to affluent neighborhoods.<sup>120</sup>

The result is that people in economically depressed areas must often go outside of their community for healthy eating. For many transit dependent and working people, the convenient choice is to find a nearby meal, even if that leads to a diet of high-caloric but nutrient-depleted snacks, processed and fast foods. Numerous studies now demonstrate the correlation between a limited food environment and high levels of nutrition-related diseases such as obesity, diabetes and heart disease.<sup>121</sup> In essence, the food desert environment condemns its residents to chronic health issues and pre-mature death, making the question of food access and affordability a significant racial and economic justice issue.

**Environment.** Major industry concentration in food retail—especially among supermarkets—has had numerous environmental impacts on local and system-wide levels. Retailers’ dominant position in relation to

distributors and producers allows them to squeeze suppliers for low prices and slot fees (a charge for allocating shelf space for products), as well as demand product specifications about texture, color and packaging that pressure suppliers to employ environmentally damaging practices and often lead to massive waste of edible but aesthetically imperfect food.<sup>122</sup>

The centralization of food retail enterprises also means that food travels longer distances before reaching market.<sup>123</sup> In order to provide seasonal produce like bananas and strawberries year round, supermarkets import produce from across the globe during the domestic off-season through complex supply chains of petroleum-driven ship, plane and truck transport.

On a local scale, the building envelope of the supermarket has grown enormously over the last century, taxing local infrastructure in more ways. “Big box” retailers push out smaller stores in the area, causing consumers to rely more on vehicular travel and longer distances for grocery shopping trips.<sup>124</sup> Supermarkets are the largest industrial emitters of HFC (hydrofluorocarbon) gases, which are widely used as a coolant in freezers and refrigerators and have a dangerous global warming impact.<sup>125</sup> In addition to other sorts of packaging waste, customers significantly contribute to the 100 billion plastic bags used annually in the US, which are made from an estimated 12 million barrels of oil.<sup>126</sup> Single-use plastic bags are also notorious for hurting wildlife when they reach oceans and rivers.

## **Sustainable and Just Food Retail: Market Trends for A New Food Economy**

### **Grocery at the Center: Food Retail as an Economic Development Driver**

To counter food deserts, policy makers and community groups alike are looking to supermarkets as an anchor for economic development and job creation in low-income communities. Municipalities across the country are devising incentive packages for supermarkets to open new stores in inner-city areas that include redevelopment financing, streamlined permitting, technical assistance and marketing services. While grocery stores do tend to stabilize larger retail developments and bring much-needed access to fresh food, a focus on attracting large food retail alone does not guarantee the creation of good jobs, sustainably procured food or local wealth building. Community and labor collaborations can address this by pushing for and strengthening Community Workforce Agreements, Community Benefits Agreements and public policy that sets high road standards for jobs and community benefits as the store is being built and once it is operational.

### **Direct Connection: Farmer’s Markets & Community Supported Agriculture**

Direct market sales allow consumers to connect directly to their local producers and access healthy food right in their neighborhoods. The number of farms that sell directly to consumers is increasing, with over 136,000 farms in 2007 generating \$1.2 billion in sales. Still the overall share of direct marketing is only 0.4 percent of total agricultural sales.<sup>130</sup> Lacking the volume and facilities to meet the demand and specifications of large grocery stores, small farms in particular rely on farmer’s markets and Community Supported Agriculture (CSA) programs to sustain themselves.

In the past 15 years, the number of farmer’s markets has more than tripled; there are now over 6,000 farmer’s markets nationally.<sup>131</sup> By reducing the distance traveled from farm to plate, farmer’s markets reduce green house gas emissions expended in the food system. Farmer’s markets also stimulate financial and social capital in the urban neighborhoods where they take place by promoting better nutrition, health literacy and cultural public

## **Innovative Partnerships Re-Think the Procurement Paradigm**

Regional grocery chain Ball Foods Stores in Kansas created a strategic partnership with Good Natured Family Farms, an umbrella brand and cooperative that aggregates the agricultural products of over one hundred small farms within 200 miles of Kansas City. Together, the retailer and the supplier established innovative protocols to allow the partnership to thrive. Ball Foods Stores changed internal policies to open its 55,000 square food distribution center to local farmers. Significant floor space within the store is now dedicated to locally grown food in an effort to create a model for a “farmer’s market within a grocery store.”<sup>128</sup>

spaces to socialize and build community.

Unfortunately, the environmentally beneficial “low tech” facility requirements of farmer’s markets have made it difficult for food stamp beneficiaries to make purchases at farmer’s markets with the electronic benefits transfer (EBT) card. To address this barrier, several programs and municipal policies have begun to make targeted infrastructure upgrades at farmer’s markets so that public benefits recipients can have greater access to this amenity. The Ecology Center has a statewide program in California that helps farmer’s markets establish a Central Point of Sale (POS) terminal where EBT users can redeem benefits in the form of paper, or token “scrip,” which can then be used for shopping throughout the market. At the end of the day, each vendor cashes in the scrip for cash or receipt of future payment.<sup>133</sup>

### Food Sovereignty through Local Control and Community Ownership

Cooperative and worker owned grocery stores and restaurants are modeling a kind of “food sovereignty” by building localized wealth and providing local jobs through collective ownership and community-driven food planning. Grocery stores like People’s Community Market and Mandela Food Cooperative, both in Oakland, CA, demonstrate the power of social entrepreneurship to address a lack of food access while activating learning and skill-sharing among residents. For example, in both cases, the grocery store acts as a place for nutrition education, healthy cooking demonstrations and community meeting space.<sup>136</sup> Both stores were incubated by community-based organizations and designed to financially succeed in a food desert community by leveraging existing social capital. People’s Community Market CEO Brahm Amadi describes this as a “hybrid value chain” where the enterprise relies on the strength and consistency of community alliances and the mobilization of a community base.<sup>137</sup>

## IN THE SPOTLIGHT: Companies Paving the Way

### City Fresh Food

Rooted in the Roxbury neighborhood of Boston, MA, the foodservice provider City Fresh Food holds as its mission to provide career opportunities in economically distressed areas as well as provide high-quality, locally grown, culturally relevant and *affordable* food products to customers. This \$4 million enterprise employs 65 local residents and delivers 4,000 nutritious, hot meals every day to schools and senior centers throughout Boston. According to the City Fresh website, the company is “presently majority owned and operated by community residents. We practice open book management and offer profit sharing to all employees who have been with our company a certain amount of time. The City Fresh Foods leadership is working towards 100 percent community ownership.” The company has forged relationships with a few local suppliers of grass-fed beef and organic

## Policy to Promote Convenience Store Conversions

To make a lasting impact, convenience store operators need extensive marketing and technical assistance to deal with perishability, resident preferences and other unique issues that arise with produce sales. The Community Market Conversion (CMC) program at the Community Redevelopment Agency of Los Angeles offers storeowners technical assistance and full-scale building rehabilitation to re-purpose the corner store into a place where local residents have easy and affordable access to fresh food. The technical assistance is designed to ensure that the switch to fresh food is financially viable for storeowners. The façade rehabilitation aspect seeks to beautify the corner store to look and feel like a healthy food retail outlet. In collaboration with local non-profits, this new program intends to nurture a local customer base through in-store taste testing events, a youth-driven “healthy retailer” signage design contest and other community-based planning activities for the corner store retrofits. A pilot version of the program is set to launch in early 2011 with support from the Los Angeles County Department of Public Health.

squash, and is working with a local urban farm to supply salad greens. Additionally, City Fresh offers educational and financial opportunities to its employees, including English language training, computer workshops and job efficiency seminars.

### **Colors Restaurant, a Project of Restaurant Opportunities Center-NY**

The national workplace justice organization Restaurant Opportunities Centers United (ROC) seeks to model high road industry practices with their worker-owned restaurant “Colors” in New York City. The attacks on the World Trade Center on September 11, 2001, destroyed a restaurant called Windows of the World, leaving 300 employees out of work. While the owners re-opened in Times Square they only re-hired managers and white employees. After a campaign by ROC-NY and the Hotel Employees and Restaurant Employees (HERE) Union Local 100, the restaurant created an additional 15 positions for former employees. Other former employees went on to found the highly successful Colors restaurant, which offers a global menu as diverse as its staff. The restaurant sources about 50percent of its menu from local, small and mid-sized producers, including beverages from sustainable and small-batch operators. Its mission statement states, “We are a worker cooperative that enables workers through self-governance and stands for better working conditions, improved wages, racial equality, and career mobility in the restaurant industry. By proving that restaurants can provide better wages and working conditions while still making a profit, Colors hopes to serve as a model for other restaurants.”

## **THE WORLD OF WORK: Green-Collar Jobs for Sustainable Food Retail**

### **Evolving Knowledge, Skills and Abilities**

In addition to being the place where people eat and purchase food, food retail establishments are increasingly the site for educating consumers about healthy eating, nutrition and the food system in general. Techniques include marketing and product display, cooking demonstrations and sample offerings, workshops and other educational programming. Promoting culinary and nutrition literacy is a way to sustain demand for emerging sustainable food enterprise, especially in food desert neighborhoods where historically food retail options were lean. Consumers themselves are inquiring more about the food they are putting in their bodies, where it comes from and how to cook and store it. This shift means workers in every food retail industry need increased familiarity with nutrition, labeling and certifications (for example, country of origin labels), culinary arts and marketing. This is especially true for workers that interact with customers most such as cashiers and courtesy clerks in grocery stores and servers and counter attendants in food serving establishments.

### **The Effect of Localization**

As local sourcing becomes more prevalent, “back of the house” grocery store workers like stock clerks and order fillers gain facility with storage and handling requirements for fresh regionally-grown food, as well as the mechanics of distribution associated with a regional (versus global) supply chain. At grocery stores invested in expanding their local food lines, departmental purchasers and managers will spend more time developing joint marketing and conducting collaborative demand forecasting with local suppliers to ensure the success of those new product offerings, which is a departure from the style of business with large wholesalers or growers. Even at the retail level, the localization of the food system requires personnel with experience in logistics and supply chain management to fill the current gap in regional distribution infrastructure, especially in direct sales enterprises.



## FOOD SYSTEM OVERVIEW

# FOOD WASTE TODAY

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**Economics.** According to the USDA, Americans throw away roughly 96 billion pounds of food waste annually, at a cost of over \$1 billion dollars just in disposal.<sup>142</sup> Most of this food is edible, but fails to reach consumers because of market gluts, price failures, cosmetic defects, bad weather, overstocking, and expiration.

**Equity and Labor.** While it is difficult to determine how many workers handle food waste specifically, we do know that the work is particularly dangerous for the 357,000 workers in the sanitation industry, of whom at least 135,500 worked directly in trash and recycling collection, truck driving, and material moving in 2009.<sup>143</sup> The waste management industry has had fatality rates up to ten times the national average for all industries in some years.<sup>144</sup> Working conditions for trash and recycling employees vary based on union membership and whether workers are publically or privately employed. A case study of waste and recycling workers in Los Angeles demonstrates the difference between public and private sector work in this industry, and particularly the problems with under-regulation of basic standards and practices. The study reveals that in Los Angeles, public sector employees in residential waste services enjoy living wage jobs, strict safety enforcement, and ongoing safety training. Their counterparts in private commercial and industrial waste collection companies—which are not subject to any wage standard and only minimal safety oversight—endure abysmal, unsanitary and unsafe conditions, work long hours with inadequate training, earn poverty wages, and often lack basic safety equipment to protect them from the dangerous toxic substances and pathogens they are exposed to on the job.<sup>145</sup> Today, approximately 30,000 solid waste sanitation workers are organized by the International Brotherhood of the Teamsters Union, though the union hopes to one day bring 150,000 sanitation workers nationwide into collective bargaining agreements to ensure better pay and safer working conditions.<sup>146</sup>

In addition to labor issues in waste management, food waste constitutes a larger equity issue in terms of hunger and food insecurity. The disposal of edible food by producers, distributors, and retailers is not only wasteful and costly, but is also particularly ironic in the face of widespread food insecurity in the US. As wages have stagnated over the past decade while food prices have risen, the nutritional intake of low-income families has suffered, leading to public health crises such as obesity and diabetes. The recession and high poverty and unemployment rates have exacerbated food insecurity among low-wage workers and their dependents, with 50.2 million Americans living in food insecure households in 2009.<sup>147</sup> Farm workers in particular suffer from high rates of food insecurity because of low wages, lack of access to retail stores, and exclusion from federal nutrition assistance programs due to immigration status.<sup>148</sup>

**Environment.** Residential and commercial food waste constitutes the third largest waste stream in the nation after yard waste and paper.<sup>150</sup> Less than 3 percent of all food waste is recovered or recycled into compost. The rest ends up in general landfills, where it constitutes up to a third of landfill volume. The lack of oxygen in landfills prohibits decomposition of otherwise biodegradable, non-toxic food waste. Landfills are the second largest source of methane emissions in the nation, a greenhouse gas 21 times more potent than carbon dioxide. The location of waste sources poses a serious environmental justice issue as well. Landfills as well as waste sorting and processing facilities are generally sited near low-income communities where they pose a health risk to

surrounding populations from the excess truck traffic and emissions generated by their operations.<sup>151</sup>

Waste from conventional food production, especially animal farming, is also environmentally hazardous. Confined Animal Feeding Operations (CAFO's), also known as factory farms, store animal waste in massive unlined lagoons sometimes the size of several football fields. This toxic sludge also emits millions of pounds of methane, and seeps into groundwater and soil causing health and safety hazards to wildlife and humans.<sup>152</sup> Sludge from these lagoons is also sprayed on crop fields as fertilizer, a practice suspected as a culprit in some food-borne illness outbreaks such as salmonella and E. coli.<sup>153</sup>

## **SUSTAINABLE AND JUST FOOD WASTE RECOVERY AND RECYCLING: Market Trends for A New Food Economy**

### **Compost: The Other “Black Gold”**

The best way to recover value from inedible food waste is to process it into a rich soil amendment known as compost. Compost is decomposed organic matter rich with beneficial nutrients and soil organisms. With the erosion and degradation of most of the nation's valuable fertile topsoil caused by industrial agriculture, compost provides a sustainable source of soil enrichment and regeneration, reducing the need for heavy water, fertilizer, and pesticide use. Composting food scraps is a basic household practice in many parts of the world, but is only recently gaining popularity in the US as a sustainable gardening and farming technique. The practice essentially requires the separation of organic waste (fruit peels, vegetable tops, egg shells, etc.) from inorganic waste (plastics, glass, synthetic materials). The organic waste is left to decompose for several weeks or months until it produces compost.

While some ninety municipalities accept residential food scraps in yard waste composting programs,<sup>154</sup> most lack the capacity to process the vast majority of food waste from commercial customers like hotels, restaurants, and cafeterias. A few exceptions include Seattle and San Francisco, which both have mandatory composting laws and contracts with industrial-sized compost facility operators who can process the waste and market it as compost. San Francisco's composting program is meant to help reach the City's “Zero Waste” goals by 2020. Seattle's law exempts businesses and apartment buildings but is nonetheless hailed as one of the most forward-thinking waste diversion strategies. Supermarkets and restaurants can save up to \$40,000 per year on disposal costs by participating in municipal compost programs where they exist.<sup>155</sup>

### **Biogas and Methane Harvesting**

Methane gas is a byproduct of the anaerobic (“lacking oxygen”) digestion of raw sewage and other decomposing matter. It is highly toxic, an abundant contributor to climate change, and unfortunately one of the major byproducts of the food system. However, with the right technology, methane can be harvested and used to generate energy. Straus Family Creamery in Northern California has installed a methane digester to capture energy from the manure of their dairy cows. After five years of using the technology, they now generate 300,000 kilowatt-hours per year, enough to power the dairy with electricity and save \$40,000 on energy bills annually.<sup>156</sup>

### **Gleaning Programs for Unharvested Crops**

The paradox of growing hunger and food insecurity amid rampant excessive food waste has spurred many non-profits and food banks to develop gleaning programs. Such programs arrange with producers to glean fields for the unharvested crops left behind due to cosmetic flaws, bad weather, or price failures. By some estimates, 10-20 percent of crops in the US never leave the field.<sup>157</sup> Most gleaning programs rely on volunteer labor, but one award-winning non-profit Hidden Harvest in the Coachella Valley of California actually hires low-income farm workers at \$10/hour (above typical farm worker wages) to glean fields and orchards and “rescue” food from packing houses.<sup>158</sup> The food is then donated to food banks and soup kitchens. In 2008, Hidden Harvest delivered over 1.5 million pounds of edible produce otherwise slated for landfills to over 44,000 low-income families through their partner agencies. This model combining food waste recovery, hunger abatement, and prevailing wage job creation is unique in the nation.

## IN THE SPOTLIGHT

### RecycleMatch

RecycleMatch found its niche matching sources of recoverable waste materials with potential users who can reuse or recycle them. They created an online marketplace where industrial producers advertise what materials they need to get rid of or what materials they are looking for, find a buyer or a seller, and make a sale. All parties involved benefit from the extended value of otherwise discarded materials, as the seller saves on disposal costs and receives income for its trash, and the buyer can find cheaper materials. They host a variety of material categories in their marketplace, one of which is food and organic substances. Most listings in this category are byproducts from food processing operations advertised as consistent waste streams of up to 40,000 lbs/day. RecycleMatch takes a one-time consulting fee from both sides and ongoing fees based on tonnage for up to three years after original sale if the exchange relationship continues. This model exemplifies the kind of small business opportunity in simply providing a link in the broken value chain that leads to excessive waste and pollution.

## THE WORLD OF WORK: Green-Collar Jobs for Sustainable Food Waste Recovery

### The Emerging Waste-to-Energy Sectors: Compost and Biogas

While data on the current state of jobs in the food waste sector are sparse (only seven states reported for the industry in the 2007 US Economic Census), several green job creation opportunities are already apparent. As new municipal composting programs demonstrate success in meeting diversion goals and GHG reductions, composting could become a common service in cities across the country, opening up employment opportunities for collection drivers, machinists, technicians, soil specialists, and more (see Appendix B).

The growth of biogas energy generation such as methane harvesters appears inevitable. Doug Williams, an engineer who helps design digesters for dairies across California, says the technology is well suited for large-scale operations. He notes that while only 15-20 methane harvesters currently operate in California dairies, there is potential for 200-300, a significant untapped sector that could not only drastically reduce GHG emissions and provide renewable energy, but could create thousands of construction and permanent technician jobs.<sup>159</sup>

### New Small Enterprise Opportunities

Greening the food waste sector will especially create opportunities for small business development that can offer waste diversion and recovery services. In conversation with Brooke Betts Farrell, owner of RecycleMatch, about the job creation potential of her company model, she remarked that these types of linkages create opportunities for a whole new small business economy in the recycled materials marketplace. It will ultimately allow small businesses to thrive and create more good green jobs.

### Evolving Knowledge, Skills, and Abilities

As with other green food sectors, knowledge and skills in the development, implementation, operation, and management of new waste recovery systems and processing technologies will be key to greening the food waste sector. Efficient recovery programs that can divert more of the urban and industrial food waste streams will need to be developed, which may require innovation in anything from collection truck technology to infrastructure improvements. Expertise with existing technology such as installation and operation of methane digesters and industrial composters is required to expand their use in agricultural and livestock operations and make a greater environmental and economic impact. Further innovation in models of diversion and repurposing of waste materials and byproducts will become increasingly necessary as cities and states tighten waste diversion and energy efficiency targets.



## THE ROLE OF POLICY

AS ENGAGED COMMUNITIES AND innovative businesses are laying the foundations for a new food system, it is essential to understand the role of policy in the food system change equation. Government policies play a significant role in structuring and regulating our food system and are indisputably a key aspect of the solutions that can transform it for the better. Policies like the US Farm Bill and federal agencies such as the Food and Drug Administration (FDA) and US Department of Agriculture (USDA) influence food prices, production practices, labor standards, food safety, and nutrition programs. Today there is growing public awareness that industry lobbies have for decades wielded influence to enact policies that favor their profitability, often at the expense of the environment, workers, and equitable economic opportunity, laying the foundations for food system failure.

As momentum for food system change grows, communities are already deploying policy levers at all levels of government to intervene in problems like food access, affordability, hunger, environmental degradation, health disparities, and poor working conditions. We can point to different examples of innovative policy solutions that thoughtfully engage questions of real community economic development and comprehensive community health and food security.

### State and Local Policy Innovations

Pennsylvania's Fresh Food Financing Initiative (PFFFI) is a state level initiative that tackles food deserts in low-income communities. In response to a severe lack of access to fresh food in Philadelphia, a public-private partnership formed in 2006 to take on the challenge of transforming the city's foodscape. The Food Trust partnered with The Reinvestment Fund and the Greater Philadelphia Urban Affairs Coalition to advocate for a program that would increase the number of supermarkets, particularly in low income areas where access was most limited and obesity and diabetes rates high. The Food Trust found that Philadelphia had the second lowest number of supermarkets per capita of all major US cities.<sup>160</sup> PFFFI's goal was to help finance supermarket operators to develop grocery stores in underserved areas, and the initiative has successfully helped develop 88 supermarkets across 34 Pennsylvania counties.

The success of the program has caught nationwide attention, with the National Institute of Health now studying the program as a public health model. President Obama has proposed a national program called the Healthy Food Financing Initiative (HFFI) based on the Pennsylvania initiative in his FY2011 budget, hoping to leverage \$400 million to increase food access in the nation's worst food deserts. Several states are already organizing platforms to put those funds to work in local communities as soon as they become available.

City-level efforts similar to PFFFI are innovating grocery retail development strategies and have the advantage of leveraging policy tools specific to municipal jurisdictions. In spring of 2009, New York City unveiled its citywide supermarket initiative called Food Retail Expansion to Support Health (FRESH) NYC after a study

found that 3 million New Yorkers live in high need areas. The program offers a variety of incentives to encourage grocery store development in underserved areas. Beyond the financing model of the Pennsylvania initiative, the local jurisdiction allows the city to include a broad array of land use incentives in designated areas that only local governments can provide. These include permitting stores in light industrial zones, relief from parking requirements deemed unnecessary for the area, and a density bonus for residential projects that build grocery stores on the ground floor.<sup>162</sup> The land use policies incentivizing grocery store development also include clear and specific language on square footage requirements for fresh produce, and stores that fail to comply risk losing their incentives. Despite its intention, the FRESH NYC program is not without critics. The non-profit Neighborhood Retail Alliance argues that the FRESH program ignores the issue of retention of existing stores, which is a growing problem in New York City.<sup>163</sup>

Questions around policy approaches require healthy debate and, ideally, democratic engagement in order to be resolved on the local level. One such vehicle is Food Policy Councils<sup>164</sup> forming throughout the country to generate comprehensive food policy platforms. Though now more than 30 years old, the Food Policy Council model is newly emerging as a governance body, usually (but not always) located within city government, that stimulates dialogue between various government agencies and the many stakeholders within the food system.

Food Policy Councils can provide the forum for developing innovative policy solutions on a localized level. An example of such legislation might include policies for local procurement. Many cities, counties, universities, and school districts have identified opportunities to influence the food system through the strength of their own buying power as purveyors of millions of hospital, school, prison, and cafeteria meals. Los Angeles is currently considering a procurement policy that would require certain percentages of its purchasing to be from local growers. Other procurement policies set goals for purchasing foods with higher worker standards, sustainable or organic production, and increased nutritional value.

## **Engaging Federal Policy: The US Farm Bill**

While creative policy solutions largely driven by community-based food system projects are already changing local food environments, limitations imposed by some existing policies ultimately hinder systemic change if not properly taken into account and addressed. The long-term viability and scalability of some community-based, municipal, and even state programs is ultimately limited if policies that shape and inform a broken food system are not directly taken on as well.

Such is the case with the US Farm Bill, the largest single piece of legislation affecting the US food system and its participation in the global food market. It is the primary source of federal law governing agriculture and nutrition programs. Revised and renewed every five years, the current 2008-2012 Farm Bill (officially titled the Food, Conservation and Energy Bill of 2008) has a budget of \$300 billion, of which \$187 billion (67 percent) goes to fund the Supplemental Nutrition Assistance Program (SNAP), formerly known as food stamps, and the national School Lunch program. Roughly \$42 billion (15 percent) goes to commodity subsidies, such as corn, wheat, rice, cotton and soy,<sup>165</sup> and the remaining \$22 billion (8 percent) goes to crop insurance.

Food system activists and public health advocates often blame the Farm Bill for contributing to public health crises by creating a glut of cheap grains, oils, and sweeteners such as high fructose corn syrup. The bill's commodity payments essentially act as subsidies to make unhealthy oils, sugars and meat the cheap and affordable foods on the market, particularly for low-income communities. Corn syrup, which some studies now show is linked to obesity and diabetes,<sup>166</sup> has largely replaced cane sugar as the top sweetener thanks to deep subsidies<sup>167</sup> advocated for by big grain lobbies in Washington. Corn has received an estimated \$78.3 billion in government subsidies since 1995.<sup>168</sup> Commodity payments also play a significant role in subsidizing industrial meat production through supports to grain for feed, identified as one of the main sources of environmental pollution and degradation caused by the food system.

As research accumulates on the connection between the bill's commodity subsidies and obesity,<sup>169</sup> some argue that revisions to the Farm Bill to support more fruit and vegetable production are crucial. Fruits and

vegetables, considered “Specialty Crops” in the Farm Bill, are not eligible for the same direct payment subsidies as commodity crops and are thus more expensive to produce and less affordable to consumers locally. “Specialty Crops” do not receive the same protections through the Crop Insurance programs in the Farm Bill as commodity crops do, making fruit, vegetable, and nut farmers vulnerable to disaster, weather, or economic-related crop failures.<sup>170</sup> This disadvantage could explain why out of 310 million acres of total US cropland, only 7.7 million, or 2.5 percent, is dedicated to fruits and vegetables, hardly enough to produce a supply that fulfills the recommended daily consumption for all Americans.<sup>171</sup> By essentially subsidizing unhealthy foods and leaving fruit and vegetable farmers out to dry, the Farm Bill impacts the ability of farmers to produce more healthy food for local markets, leaving those communities reliant on a broken national food system. And as the funding source of SNAP benefits, which are the nutritional lifeline of many low-income families, the Farm Bill is essentially subsidizing unhealthy foods and simultaneously providing the purchasing power to low-income communities to buy those foods. This incongruence reminds us that the food industry is an interconnected web that is merely the sum of its parts and that reform must be approached from a food systems perspective to be effective and sustainable in the long-run.

One approach to making healthy food affordable is seen in efforts to change the Farm Bill’s nutrition program guidelines to increase public benefits for fruits and vegetables, such as expanding the use of SNAP benefits at farmer’s markets. While not addressing the issue of subsidies directly, this has the potential to increase demand and production of healthier foods on a national scale while maintaining affordability for consumers. These types of programs need proper policy and technical assistance from government agencies on local and state levels to ensure they are implemented successfully.<sup>172</sup> Once they are successfully attached to the Farm Bill on paper, their successful *implementation* is critical to ensure that the incremental gains achieved through campaigns for Farm Bill reform actually bear fruit.

The current 2008-2012 Farm Bill includes some incremental gains for a greener food system. It allows for “geographic preference” in government procurement policies, giving local governments authority to use their buying power to prioritize locally-produced foods and includes \$33 million for the Farmers Market Promotion Program. Nonetheless, it has been criticized for maintaining the decades-old commodity payment system and doing little to stop the concentration of the food industry in fewer hands.<sup>173</sup> There is still much work to be done to transform the Farm Bill from a federal policy barrier to better local food systems into a supportive policy solution. Food activists need to remain persistent

## The Farm Bill: Get Informed and Get Active

With the reauthorization of the federal Farm Bill every five years, there is real opportunity for food activists to link their reform efforts on the local and regional level and influence federal policy with the upcoming reauthorization in 2012. The time is now to tap into the momentum of the burgeoning sustainable food movement, couple local innovation with policy reform, and influence the direction of our food system by engaging reform on the federal level. Failing to do so would be a wasted opportunity, one that millions of Americans can ill afford.

Many local, state and national non-profit and sustainable food industry organizations follow Farm Bill issues and participate in the debate through journal articles, blogs, online forums and publications. For those looking to read up on the Farm Bill and learn about Farm Bill campaigns, a few places to start follow:

- **Institute for Agriculture and Trade Policy’s Ag Observer**, a domestic and international agricultural monitor, follows the debate over the Farm Bill in their Farm Bill Watch series, releasing research and analysis on current and future Farm Bill concerns for sustainable farmers, fair trade and labor advocates.
- **National Sustainable Agriculture Coalition (NSAC)** has been engaged in education and advocacy around the last four Farm Bill cycles. They conduct education and lobbying campaigns throughout the legislative process of Farm Bill renewal through Congress, as well as ongoing oversight and advocacy work on ensuring implementation and funding of new Farm Bill programs related to sustainable agriculture. NSAC released their “Grassroots Guide to the 2008 Farm Bill,” which provides useful information and analysis of all the bill’s programs related to sustainable agriculture, spreading the word about available grants and support for sustainable farmers.

in their efforts with long-running campaigns to enact changes with each new Farm Bill. One day the elimination of cheap food commodity subsidies may take a place in history alongside the eradication of tobacco subsidies as a seemingly insurmountable challenge that was nonetheless accomplished in the interest of public health.



# CONCLUSION

## Key Findings

Taking stock of the current state of the food system, the size and structure of industry sectors, emerging community and market driven models for social and environmental sustainability, and the role of policy in advancing or limiting meaningful change, a few key findings emerge:

- **Reform Requires a Food Systems Analysis.** All reforms related to food need to be understood and examined *as a system*, a fundamental logic too often overlooked. The reality is that the food industry is an interconnected web that is a sum of its parts. When agricultural models change, distribution must adjust. When retail patterns change, all suppliers must adjust. Food-related efforts must grasp the interconnectedness of the entire food system or risk being ineffective, or worse, exacerbating problems at other stages. For instance, increasing enrollment in food stamps to address the issue of food insecurity is not an effective long-term policy if those low-income food stamp recipients cannot access healthy foods that provide proper nutrition in their neighborhoods. Nor does it impact the reality that some 40 percent of all food produced in the US is thrown away rather than eaten.<sup>176</sup> Policy measures that do not address multi-sector, systemic problems do little by way of real, long-term sustainable reform. Thoughtful reform in one sector can reverberate and improve the lives of workers and consumers throughout the food value chain.
- **Greening the Food System Achieves Multiple Objectives.** The multifaceted nature of the food system presents an opportunity for *holistic* community economic development that not only promotes the health of people and the environment but is also integral to a green jobs movement. Green jobs practitioners and advocates are expanding quality, family-supporting employment opportunities in food-related work through community-driven enterprise, innovative economic development policy and jobs training programs. Food-anchored economic development often also meets other community interests such as the need to expand recreational spaces through food gardens, promote nutrition literacy and decrease diet-related disease, strengthen therapeutic programs, revive culinary craft as a tradition, stimulate entrepreneurship and community wealth building, and strengthen community and cultural ties.
- **Cross-Sector Stakeholder Collaboration is Imperative.** Transformation of an interconnected food system requires a multi-level, multi-sector strategy that both problem-solves on local, geographically-linked issues and targets the larger economic and policy structures which determine practices throughout the supply chain. Multi-sector strategies will require collaborations among diverse food system stakeholders in urban and rural places, including industry players, consumers, policymakers, public health advocates, labor unions, and community activists.
- **Momentum is Growing with New Partnerships and Coalitions.** Many economic development poli-

cies and programs connected to food are in their nascent stages as popular awareness of the link between the environmental and equity crises in the food system has emerged only in the last 5-10 years. Sustainable food advocacy, the environmental justice movement and organized labor each have their own well-established history that intersects with aspects of the food system. These three movement sectors are newly coming into dialogue in a way that considers the underlying economic development structures that generate social and racial inequity and environmental degradation in the food system. As interest and urgency around food system change grows, promising momentum is building.

- **Local Efforts Must Engage National Policy.** Local food system change is ultimately limited by policy that informs and shapes the multi-sector food industry. Many sustainable food activities on the local, regional and state levels are responding to the food system failures of an industry structure largely created or propped up by national policy. Stakeholders who seek to affect change in the food system should not only consider how to foster and scale exciting innovation in communities but also consider policy advocacy, especially around the reauthorization of the federal Farm Bill in 2012, the primary food and agriculture policy tool of the federal government.

## **A Call to Action: Next Steps for Practitioners, Community Activists & Policy Makers**

- **Build Local Capacity.** Many community-based sustainable food projects and businesses have been established in the last two to five years, and rely on social networks and community organizing to expand their reach and market the value of their products or services. To continue to generate demand for innovative sustainable food practices, practitioners and advocates must engage in education, outreach and activism and connect with their counterparts in local communities across the country. Imperative is also the need to lift communities out of poverty by transforming wages and creating good jobs that will do more to improve community health than simply distributing more food, increasing food stamp enrollment or banning fast food restaurants. Showcasing best practices will inspire a broad group of stakeholders interested in food system reform with *what is possible*. Building on work that is already occurring, new initiatives should connect to local priorities, and expand capacity broadly.
- **Connect Local Innovation to Policy.** As momentum for food system change grows, communities are deploying policy levers at all levels of government to intervene in problems like food access, affordability, hunger, environmental degradation, health disparities, and poor working conditions. It is critical that practitioners and food activists continue to advocate for policy changes that further the greening of local food systems to ensure that innovation takes hold, propagates and can serve as a model for change on the local, regional and national level. We can point to different examples of innovative policy solutions that thoughtfully engage questions of real community economic development and comprehensive community health and food security.
- **Engage Policy for Systemic Change.** With the reauthorization of the federal Farm Bill every five years, there is real opportunity for food activists to link their reform efforts on the local and regional level and influence federal policy with the upcoming reauthorization in 2012. The time is now to tap into the momentum of the burgeoning sustainable food movement, couple local innovation with policy reform, and influence the direction of our food system by engaging reform on the federal level. Failing to do so would be a wasted opportunity, one that millions of Americans can ill afford. To ensure long-term transformation of our food system, practitioners, community activists and policy makers need to (1) understand how local and regional issues connect to federal policy, (2) identify and connect with the many bodies of research and activism already underway to shape the Farm Bill in 2012, and (3) organize now to link to these reform efforts. Grassroots efforts equipped with knowledge and strategy can add their voice to the debate over the 2012 Farm Bill and have the potential to finally tip the scales toward a national policy that supports rather than works against a healthy, fair, and sustainable food system for all.

# APPENDIX A

## FOOD SYSTEM SECTOR ANALYSIS

**PRODUCTION** entails the growing or raising of food in fields, orchards, ranches, farms or fisheries. This includes products consumed fresh such as fruits and vegetables, and raw materials for processed foods such as corn, wheat and soy.

### The Crisis

#### Equity:

- Farm workers endure some of worst working conditions in the country, including long hours, lack of health care or quality housing, exposure to pesticides and extreme elements, and wage theft.<sup>171</sup>
- Millions of small farms have gone out of business in the last 40 years due to corporate consolidation, development pressures and difficulty securing capital.<sup>178</sup>
- A history of discrimination against Black farmers by the USDA has resulted in over \$1 billion in settlements in 2010.<sup>179</sup>
- Industrial agriculture and federal subsidies for commodity crops have led Americans to a narrow diet inundated with corn, soy, wheat and meat.

#### Environment:

- Factory farming is the largest greenhouse gas emitter in entire food system—60% of the food system's total GHG emissions.<sup>180</sup>
- 80% of water drawn from fresh water sources goes towards agriculture.<sup>181</sup>
- Conventional farming is heavily dependent on fossil fuel inputs for machinery, fertilizers, and pesticides.
- Pollution from pesticides is poisoning soil and groundwater.
- Soil erosion from tilling and mono-cropping threatens long-term food security.
- Deforestation for livestock and crop production advances climate change.

### The Opportunity

**Organic Means More Jobs:** Organic and sustainable farming tends to create more jobs and offer more room for advancement.<sup>182</sup>

**Food access:** Urban farming improves access to fresh food in food desert neighborhoods, and can supplement a family's food budget by \$500 to \$1,200 worth of produce a year.<sup>183</sup>

**Growing Entrepreneurship in the City:** "Decentralized farming" and edible landscaping in backyards and small lots in cities holds promise for green jobs.

### World of Work

- Organic and sustainable agriculture requires more labor and offers workers a greater diversity of tasks and responsibilities compared to conventional agriculture. With less mechanization, workers need to be involved and familiar with every aspect of the farm operation.
- Sustainable farming tends to require that workers become skilled in integrated pest management, plant health, multi-species husbandry, soil management, habitat maintenance, landscape design, seed saving and crop rotation and other techniques.
- Changes to labor and immigration law are needed to create protections and career advancement for farm workers.
- High-density or sensitive landscapes, such as in cities, require specialized skills and training in new technologies.
- Food production skills translate well into employment with landscape companies, greenhouse nurseries or even food retail. This is important for job-training programs in urban agriculture since this sector is not yet highly job producing.

**PROCESSING** is the preparation of raw foodstuffs into consumable products. This includes butchering, cleaning, and packaging of meats, fish, and poultry; milling grains; pressing oils; and preparation and packaging of value-added goods such as canned, dried, pickled, frozen, or otherwise preserved foods.

## The Crisis

### Equity:

- Processing has the highest incidence of injury and illness, especially meatpacking.<sup>184</sup>
- Overconsumption of highly processed food rich in sodium, refined sugars and preservatives contributes to epidemic levels of nutrition-related disease.<sup>185</sup>
- 76 million illnesses occur from food contamination every year.<sup>186</sup>

### Environment:

- Food processing requires heavy energy and water use—16 % of the energy expended in the food system<sup>187</sup> and about 10% of the food systems' GHG emissions.<sup>188</sup>
- Demographic and lifestyle changes have led to greater consumption of processed and packaged food. Packaging alone makes up 7% of energy use in the entire food system.<sup>189</sup>
- Almost a third (31%) of all municipal solid waste is made of packaging and containers from food.<sup>190</sup>

## The Opportunity

**Value-Add for Sustainability:** Processing food extends the season of fresh foods through canning, pickling and preserving, which helps reduce reliance on imported food.

**Incubators & Co-Packers:** These facilities support local, sustainable growers and emerging food enterprises with affordable commercial manufacturing space and business development aid.

**Green Facilities:** Many food manufacturers are reducing water and energy waste by re-engineering their processes or replacing antiquated machinery.

## World of Work

- Traditional food craft—or microprocessing—such as canning, pickling and preserving seasonal foods supports expanded food self-reliance on a community level.
- Typical food manufacturing occupations like bakers, batch makers, and meat cutters remain largely the same though a shift toward local and sustainable foods could require facility with new ingredients, post-harvest handling techniques and machinery.
- Food science and technology occupations are on the rise, assisting in ingredient development and testing, quality control, and environmental testing and inspection of facilities to prevent contamination.
- The “greening” of food operations requires people with expertise in energy efficient and water saving technologies, industrial machinery, engineering and facility operations to install and maintain energy efficient operations.

**DISTRIBUTION** is the storage and delivery system by which food moves from farm or processing facility to consumer markets, typically via warehouse facilities that supply products wholesale. Food is transported by trucks, ships, trains, and airplanes.

## The Crisis

### Equity:

- Non-union warehouse workers at giant distributor-retailer companies endure low wages, injurious conditions.
- Hiring workers as temporary employees is a widespread practice that leaves workers with no benefits or job security.<sup>191</sup>

### Environment:

- On average, food travels 1,500 to 2,500 miles before reaching our plates,<sup>192</sup> significantly increases our food's carbon footprint.
- A complex global supply chain accounts for 11% of GHG emissions in the food system.<sup>193</sup>
- Inefficiencies in food distribution mean food is sometimes transported up to three times farther than if it went straight from farm to store.<sup>194</sup>

## The Opportunity

**Going Local:** Demand for local foods has steadily increased through consumer and retailer education efforts, which has renewed interest in supporting small- and mid-sized family farms that disappeared by the millions over the last half-century.<sup>195</sup> Innovative models of bringing more local food into markets, such as CSA's (see Production section), have the potential to make fresh, healthy foods more accessible and affordable to low-income communities.

**Grower's Collaboratives:** Small local producers are pooling resources and coordinating to develop warehousing, trucking, and logistics infrastructure to aggregate their products and give them access to local markets.

**Regional Food Hubs:** Still in the planning stages across the country, the regional food hub is a place where small farmers can aggregate orders from various sources to meet market demands, which fills a current gap in regional food systems. Attached food processing facilities, food business incubators, job training and food system education centers that foster professional development can also be part of hubs, which have the potential to be robust sources of economic development.

## WORLD OF WORK

- Knowledge of sustainable agriculture and environmental stewardship are being built into staff training and education programs among distributors.
- Knowledge of local food system issues and literacy in biodiversity and product species is increasingly required as new diversified products make it to market.
- Opportunities for worker-ownership expand in budding regional food economies, creating an environment where labor is highly regarded and workers considered valuable assets.
- With regional food hubs, expertise in handling, logistics coordination, and communications are required in a green food system characterized by more local, direct relationships.

**RETAIL** is the outlet where food is marketed and sold for consumption. Food retail is typically understood in two main categories: grocery (supermarkets, convenience stores) and food service (restaurants and cafeterias).

## The Crisis

### Equity:

- Decreased union density, which has translated into declining wages and loss of worker protection, has been a result of increased corporate consolidation among food retailers.<sup>196</sup>
- Low-barriers to entry-level jobs allow many immigrants and young people to find work but employers trend toward low road practices.<sup>197</sup>
- Food retailers have disinvested in low-income neighborhoods and communities of color, creating food deserts with limited options.<sup>198</sup>
- Limited food access in a neighborhood correlates to higher levels of nutrition-related disease like diabetes and obesity.<sup>199</sup>

### Environment:

- “Big box” retailers push out smaller stores, causing consumers to rely more on vehicular travel and longer distances for grocery shopping trips.<sup>200</sup>
- Enormous waste comes from our food retail establishments, especially supermarkets where customers contribute to the US’s annual use of 100 billion plastic bags made from an estimated 12 million barrels of oil.<sup>201</sup>

## The Opportunity

**Reinvesting in Retail:** Many public sector programs incentivize new grocery store development in underserved areas. This promotes better food access, but robust Community Benefits Agreements can ensure high road labor and environmental standards are incorporated into grocery expansion.

**Farmer’s Markets:** Farmer’s markets support regional farmers and stimulate financial and social capital in urban neighborhoods by generating business for nearby establishments, promoting better nutrition, and serving as a public gathering space.

**Community Supported Agriculture:** CSA programs link growers and consumers directly through farm product subscription services, which sustain small farmers and bring fresher food into urban areas.

**Corner Store Conversions:** Communities are converting convenience and corner stores from junk food havens to healthy community markets with produce.

## WORLD OF WORK

- Increased interest in where food comes from, how it is grown and personal health means workers in food retail will need basic knowledge about nutrition, labeling and certifications, culinary preparation and marketing.
- Localization requires department purchasers, stock clerks and order fillers in grocery stores to understand storage and handling requirements for fresh regionally-grown varieties and collaborate with a greater diversity of suppliers for successful supply chain logistics.
- Chefs and cooks are incorporating more seasonal varieties from their local region into menus, which often requires them to develop new procurement protocols and supplier relationships for their restaurants.

**WASTE** includes food or food byproducts that are discarded or recycled. Food waste in this context includes edible foods that go uneaten due to surplus, perishability, or because they are unmarketable (such as cosmetic defects), as well as food scraps from household or restaurant preparation. Byproducts of food production, processing, and distribution are also considered food system waste.

## The Crisis

### Equity:

- Americans throw away 96 billion pounds of food waste annually at a cost of over \$1 billion in disposal. In the face of massive food waste, 50.2 million Americans experienced food insecurity in 2009.<sup>202</sup>
- Many private sector waste and recycling workers endure unsanitary and unsafe conditions, work long hours with inadequate training, earn poverty wages, and often lacking basic safety equipment to protect them from the dangerous toxic substances and pathogens they are exposed to on the job.<sup>203</sup>

### Environment:

- Residential and commercial food waste constitutes the third largest waste stream after yard waste and paper.<sup>204</sup>
- Less than 3% of all food waste is recovered or recycled into compost. The rest ends up in general landfills, where it constitutes up to a third of landfill volume.
- Landfills are the second largest source of methane emissions in the nation, a greenhouse gas 21 times more potent than carbon dioxide.

## The Opportunity

**Compost:** Composting turns inedible food waste into a rich soil amendment, which is filled with beneficial nutrients and soil organisms. Some ninety municipalities accept residential food scraps in yard waste composting programs.<sup>205</sup>

**Methane Harvesting:** Harvesting biogas from decomposing organic matter such as livestock manure, food scrap waste, nut shells, and fish byproducts, can produce energy and then be used for composting, infusing value into what was once burdensome and expensive-to-dispose waste.

**Gleaning:** Approximately, 10-20% of crops in the US never leave the field.<sup>206</sup> Gleaning programs donate millions of pounds of food to food banks by arranging with producers to glean fields for the unharvested crops left behind due to cosmetic flaws, bad weather, or price failures.

## WORLD OF WORK

- Methane digestion at large-scale dairies is a significant untapped sector that could drastically reduce GHG emissions, provide renewable energy, and create thousands of construction and permanent technician jobs.
- Knowledge and skills in the development, implementation, operation, and management of new waste recovery systems and processing technologies will be key to greening the food waste sector. Efficient recovery programs that divert more of the urban and industrial food waste streams require innovation in anything from collection truck technology to infrastructure improvements.
- The growth of urban agriculture could fuel a market for fertile soil compost close to its production, and a robust commercial composting sector could meet this demand with specialized capacity, skilled labor, and waste recovery technology. Composting could open up employment opportunities for collection drivers, machinists, technicians, soil specialists, and more.

# APPENDIX B

## GREEN JOBS IN THE FOOD SECTOR: OCCUPATIONS

This chart helps identify how the greening of each of the food sectors is impacted on an occupation-by-occupation basis. The information comes from traditional occupational sources, such as Bureau of Labor Statistics, but also from interviews with industry players about how green practices are impacting the world of work for them. Because we prioritize green jobs that are pathways out of poverty, the chart identifies entry-level opportunities as well as the basic training required for entry into the occupation. The column “Career Ladder Opportunities” considers what kind of opportunity for increased pay and leadership is available with additional training and experience. For many of these green jobs, the career ladders are not clearly defined or formalized because the work is newly emerging or changing. The intention of this chart is to demonstrate potential career paths and to inspire practitioners to consider the ways local green jobs in food can lead to fulfilling careers for the community. The last column “Sustainable Practices and Benefits” anchors and identifies the way this occupation works to improve the environment.

PRODUCTION			
OCCUPATION	BASIC TRAINING & ENTRY-LEVEL WORK	CAREER LADDER OPPORTUNITIES	SUSTAINABLE BENEFITS AND PRACTICES
<b>Aquaponics Technician</b>	Aquaponics has attracted much attention and investment as an emerging but promising field in sustainable agriculture. The most direct entry point into this work is through short courses or trainings at universities or through commercial operators or non-profits. The four most established trainings are offered through the Freshwater Institute at Cornell University, University of the Virgin Islands, Aquaculture International in North Carolina and Growing Power in Milwaukee, Wisconsin. Many commercial aquaponics operators are also eager to train people with no experience who are interested in a career in this field.	While some work opportunities are available to those without formal education, aquaponics facilities need people with extensive training in bio-chemistry, plant and agricultural science, horticulture and even mechanical engineering to conduct research and development and advance aquaponics systems. Higher education degrees in life sciences would open up many doors to management level positions in aquaponics companies.	Aquaponics combines hydroponic vegetable growing with sustainable fish farming in a “closed loop” system that mimics ecological systems. The way the system works is that the fish waste acts as a natural fertilizer for the plants and the plant roots cleanse the water for the fish. The health and quantity of yields from aquaponics systems have been outstanding. The facilities can be built virtually anywhere, making it ideal for urban settings. Aquaponics opens the possibility to raise protein and grow food in the city in a healthy and sustainable manner.
<b>Apiarist/Beekeeper</b>	Beekeeping, honey farmers and apiarists harvest honey and create other products derived from bees. Formal education is not necessary, though knowledge of safety and harvesting techniques is a must and some states require certification. Some beekeepers study entomology or botany.	With work experience and additional training, employees could hold supervisory positions or work in research and development of other bee-derived products such as candy, lotions, lip balm or candles. This could translate into other work in food manufacturing. Positions in plant management, including inventory and quality control may also provide a career ladder.	Bees are an essential part of sustaining the health of our food system because of their role as pollinators. Honey pollen has numerous medicinal qualities and provides natural enzymes that strengthen the immune system.

<p><b>Horticulturist/ Gardener/ Landscaper (Small Scale, Urban)</b></p>	<p>Training in gardening and landscaping can be as basic as a weekend workshop and as extensive as an advanced degree in landscape architecture. Unpaid and paid apprenticeships are available on small farms for various amounts of time. Many university extension programs offer low cost master gardener trainings for one to six months structured around working people's schedules. Landscape companies focused on backyard gardens tend to train people with great customer service skills to do gardening work, but some basic knowledge from volunteering or apprenticing on a farm is helpful too.</p>	<p>Skills in growing and harvesting food could lead to careers in a broad array of fields including education, landscaping, storm water management, farm management, nursery work or other food related businesses like distribution or retail. Although mostly through the non-profit structure, there are work opportunities as garden-based health, nutrition or cultural workers and organizers to develop programming in community gardens and urban farms. Advanced degrees in landscape architecture, horticulture and agricultural science lead to career advancement opportunities. The evolution of technologies aimed at expanding food production in urban areas, such as green roofs, precision composting and vertical farming mechanisms offers work in the development, installation and maintenance of such systems.</p>	<p>Gardeners, horticulturalists and landscapers help cultivate green spaces and expand access to wholesome, fresh food. Knowledge of food production is essential for the design of cities and other places seeking greater food security and for connecting communities to the natural life cycles of food. The restoration of traditional food ways, especially its cultivation, is a valuable cultural and community organizing tool.</p>
<p><b>Farm &amp; Orchard Labor/ Grounds-keeper (Large scale, Peri-Urban and Rural)</b></p>	<p>Farm labor continues to have low barriers to entry, though evolutions in organic and sustainable agriculture require more highly skilled labor. Broadly speaking, changes in agricultural labor and immigration law are necessary to restore the dignity of farm work with worker protections, living wages, benefits and career advancement. However, there are small and mid-sized farms that treat their workers with respect and pay decent wages and offer apprenticeships for people interested in the trade.</p>	<p>The renaissance of sustainable and traditional agricultural methods is creating opportunities in fields like agroecology, permaculture and biodynamic farming. With these methods, farm workers typically collaborate in a variety of tasks requiring familiarity with soil health, organic pest control, seed saving and habitat restoration. Facility with bookkeeping, personnel and inventory management in additional cultivation can manage a farm operation or a large land facility.</p>	<p>The environmental and occupational health costs of industrial agriculture make the move to less petroleum dependent and exploitative farming essential. Organic and sustainable agriculture requires more labor and offers workers with a greater diversity of tasks and responsibilities compared to conventional agriculture. With less mechanization, workers need to be involved and familiar with every aspect of the farm operation.</p>
<p><b>Agricultural Technician</b></p>	<p>Agricultural technicians conduct experiments to improve yields and quality of crops, breed animals, develop crop varieties and repair and develop farm machinery. They also help develop agricultural products not intended for consumption like turning fibers into textiles. An agricultural technician must have an associate's degree in applied science in agricultural.</p>	<p>With a bachelor's degree, agricultural technicians can advance to scientist positions after a few years experience. Besides working on farms, agricultural technicians work for fertilizer companies, farm machinery manufacturers and laboratories. This line of work could also bridge into careers as a veterinarian or research and development.</p>	<p>As with food technology, the field of agricultural technology is not inherently about ecological and community health. However, technicians trained in farm operations and crop or livestock productivity are a valuable asset to any size farm using sustainable methods.</p>
<p><b>Animal Husbandry Worker/Veterinary Technicians</b></p>	<p>Animal husbandry workers raise and breed livestock. Most have an associated degree in animal science or veterinary technology, though it is common to begin as a trainee. Technicians focusing more on the veterinary aspects must be certified by the state after coursework.</p>	<p>This field can lead to careers as veterinarians, scientists or running a livestock ranch.</p>	<p>Despite the excitement around growing fruits and vegetables, the job of raising animals for food must be a centerpiece of a sustainable food system as long as the majority of people desire to eat meat. Raising livestock is one of the most ecologically unsound aspects of the current food system. Humane animal husband and health of the animal and the environment are necessary.</p>

PROCESSING			
OCCUPATION	BASIC TRAINING & ENTRY-LEVEL WORK	CAREER LADDER OPPORTUNITIES	SUSTAINABLE BENEFITS AND PRACTICES
<b>Bakers</b>	Bakers often start their careers as apprentices or trainees. Apprentice bakers usually start in craft bakeries, while trainees usually begin in store bakeries, such as those in supermarkets.	Retail Bakers of America offers four levels of certification. Entry-level certification requires no previous education but at least one year of commercial baking experience. Courses in nutrition, food safety and sanitation are encouraged or required for different levels of certification. Highest level is Certified Master Maker.	A tradition of cooperatively owned and operated bakeries like Alvarado Bakery in Sonoma County and Arizmendi in San Francisco demonstrate worker ownership models. Sustainable bakeries promote whole grain, sustainably grown grains and a just model for workers and worker ownership.
<b>Food batch-makers; Food cooking, roasting, baking and drying machine operators and tenders</b>	Typically, only a high school degree is required for production work of this kind. Workers receive training on-the-job. However, the increasingly prevalent use of computer systems to track and operate machinery requires production workers to obtain a measure of computer literacy.	In processing plants, workers may advance to supervisory positions, sales positions or become team leaders. Career opportunities may be available in management of a co-packer operation, quality control or customer services/sales. An associate or bachelor degree in a related field— for example dairy operations—can help in career advancement. Food production workers with high levels of technical skills will be in demand.	Food production workers like batch-makers are on the front line of handling and processing food ingredients. In sustainable food businesses, they should be highly familiar with diverse agricultural products—including plants and grains that are re-surfacing in American diets— and their postharvest handling and cooking requirements.
<b>Butchers &amp; Meat Cutters, Slaughterers &amp; Meat Packers</b>	Meat cutting and basic butchering has low barriers to entry and involves mostly on-the-job training. Butchers in retail food establishments are often trained in inventory management, bookkeeping and business operations. (BLS) Training for highly skilled and artisan butchers can be up to two years. Niche businesses focusing on artisan butchery may offer informal apprenticeships. Generally, handwork involved in meat slaughtering and packing is difficult to automate, making this a promising job area.	Highly-skilled butchers can manage butcher departments for grocery or food service companies. Entrepreneurial butchers can tap into growing demand for local, high-quality meat in restaurants by opening their own butcher shop or distribution operation. Workers in meatpacking and slaughterhouse facilities could advance to supervisory or management positions.	Small, mid-sized and flexible slaughterhouses and meatpacking facilities are an essential part of regional food infrastructure that support small ranchers and consumers who desire high-quality wholesome meat products. Butcher, slaughterers, meat cutters and packers in sustainable businesses are typically multi-skilled and highly proficient in food safety techniques, occupational safety, humane animal care and energy efficient packaging.
<b>Food incubator technician/instructor</b>	Those with prior experience working in food manufacturing could consider working as a technician in a kitchen incubator facility. Those with diverse cultural proficiencies and language and communications skills could contribute to extending incubation services to diverse pools of entrepreneurs.	Technicians and instructors in kitchen incubators have the opportunity to further specialize in business development assistance, quality control, operations management and consulting. This is an ideal setting for those with a passion to nurture the leadership and professional development of others.	Incubator facilities can be leveraged for wealth building and leadership development of economically disenfranchised communities and the cultivation of diverse culinary products.

<p><b>Food technologists and scientists</b></p>	<p>Most community colleges offer certification programs in food technology and processing, which are well suited for high school graduates comfortable with math and science. A Bachelors degree in physics, mathematics, biology, chemistry, nutrition, dietetics, hotel management or food technology can all find employment as a professional food technologist.</p>	<p>This is a profession likely to see continued growth. Career opportunities can be found with food processing companies, food research laboratories, hotels, restaurants, higher education institutions or government. Work experience or advanced degrees in the life sciences or engineering opens up careers as inspectors and certifiers, lead scientists, academic instructors, consultants or entrepreneurs.</p>	<p>While food science and technology is a job growth field, its use is not inherently about sustainability and community health. That said, sustainable and local food systems need workers that are skilled in technological innovation to reduce packaging waste and maintain high standards of quality for value-added products.</p>
<p><b>Industrial machine mechanics, millwrights and HVAC mechanics</b></p>	<p>Millwrights and industrial machine and HVAC mechanics assemble, install and maintain industrial machinery used in food processing plants. Union apprenticeship offers the most solid entry into a career pathway in these fields with formal classroom and on-the-job training for up to four years. Associate degrees related to industrial mechanics can also lead to work opportunities without the security of union career advancement.</p>	<p>As mechanical technologies evolve, work is expected to grow for industrial engineers and mechanics. Advances degrees and certifications in energy efficiency construction and zero waste engineering could open doors for industrial machine mechanics and others responsible for the design and repair of equipment in plant management and engineering.</p>	<p>The transition from energy and water intensive operations and petroleum-based inputs (like plastic) to a more energy and waste efficient food manufacturing requires a workforce that can innovate and adapt to evolving machine technologies.</p>

**DISTRIBUTION**

<p><b>OCCUPATION</b></p>	<p><b>BASIC TRAINING &amp; ENTRY-LEVEL WORK</b></p>	<p><b>CAREER LADDER OPPORTUNITIES</b></p>	<p><b>SUSTAINABLE BENEFITS AND PRACTICES</b></p>
<p><b>Truck Drivers, Sales Delivery Drivers, Material Movers</b></p>	<p>Drivers generally need a high school diploma for entry-level positions. A valid driver's license and in most cases a State Commercial Driver's License, offered by most public and private vocational schools, is also required. Work involves transporting goods from seller to warehouse to customer and basic truck maintenance and operation, for which they receive on-the-job training. Sales delivery drivers interact with customers and may require some basic customer service or good communication skills. Material movers operate machinery such as forklifts, and receive on-the-job training.</p>	<p>Entry-level material movers may advance to truck drivers after time on the job. Through their knowledge of daily operations and exposure to counter sales and stock rooms, drivers may advance to positions in inventory and logistics management, requiring additional on-the-job training in computer software systems. Or, they may advance to receiving or sales agents, requiring advanced training in customer service, inventory and pricing management software. Positions in repair and maintenance of warehouse equipment such as refrigeration technology or machinery are another advancement route for entry-level material warehouse workers with no prior equipment operation experience.</p>	<p>As diesel trucks are replaced by hybrid, electric, or alternative fuel trucks that burn less fossil fuels and increase energy efficiency, drivers are learning not only to operate and maintain these new fleets, but also how to optimize their energy efficiency by maintaining efficient fuel pressure and monitoring performance. As distributors green their warehouses with energy efficient lighting, solar panels, and ozone-safe refrigeration technology, a whole new level of capacity-building among warehouse staff takes place.</p>

<p><b>Purchasing Agent, Product Buyer</b></p>	<p>Large food distributors require a bachelor's degree in business-related field, as the job requires special skills like wholesale market price monitoring. Smaller food distributors will hire those without formal education who possess the necessary experience and knowledge of their industry. For specialty companies, like organic produce wholesalers, purchasers must have basic knowledge of organics certification in order to verify suppliers, true of purchasers responsible for procuring any third-party certified product.</p>	<p>Purchasing agents or buyers can advance to purchasing supervisors, managers or head purchasers to oversee overall product line offerings and make strategic decisions on where the market is going or what products they want to introduce. Knowledge of sustainable agriculture, product seasonality, and biodiversity are important for those in companies specializing in sustainable and healthy foods, and can allow purchasers to advance to higher positions. Purchasing directors at mission-driven companies may design technical assistance programs to work with farmers or micro-processors on enhancing volume and quality of production to meet market demands.</p>	<p>Purchasers can expand the market availability of organics, fair-trade, certified humane, local and regional fruits, vegetables, meats, dairy products, and processed and preserved foods with their purchasing decisions and priorities. They can play a role in finding new and cutting edge products and giving them market access.</p>
<p><b>Sales and Marketing Agent</b></p>	<p>Most employers prefer an associate or bachelor's degree in business, marketing, distribution, or a related field, though smaller companies may hire candidates with a high school diploma and some relevant sales experience.</p>	<p>Promotion to sales and marketing teams from other entry level positions is not an uncommon career ladder in food distribution companies, as delivery drivers or customer service agents with experience in other aspects of product sales may have the skills to advance to sales agent with some additional on-the-job training in transactions and marketing technologies. Sales agents may advance to supervisor or manager positions, which oversee sales teams and determine the company's direction in terms of improving service, increasing sales, or reaching other company goals.</p>	<p>Distribution companies market sustainable and healthy local products by educating their customers about their value and benefit to the food system. In addition to meeting existing demand, many values-driven companies have helped increase demand for organic, fair-trade, certified-humane, seasonal, and local product by enticing their customers to try out new products and advising them on how to showcase their green benefits to retail customers.</p>
<p><b>Communications Specialist, Training and Education Specialist</b></p>	<p>Some distributors see the need to go beyond the capacity of their marketing departments and create positions for communications specialists who design company messaging specifically around the benefits of a sustainable food system. They require bachelor's degrees in communications or marketing, though a background in sustainable agriculture may suffice for workers with strong communication skills. Values-driven companies also hire training and education specialists to ensure the workforce understands food system issues as part of their on-the-job training.</p>	<p>These positions could lead to upper management or strategic business development positions with enough experience at the company. Crossover with sales and marketing teams could offer opportunities for advancement as well.</p>	<p>Many organic and sustainable foods distributors were founded on a mission to support sustainable agriculture. Their education and messaging efforts can serve both their business goals and sustainability mission.</p>

<p><b>Food Hub Technician/Personnel</b></p>	<p>In addition to the skilled industrial construction work a new network of food hubs will create, drivers, material movers, machinists, repair and maintenance workers, purchasers, and sales and marketing agents can all bring the applicable skills and industry knowledge to make a food hub function. Experience with regional producers and products will be desirable.</p>	<p>Food hub models create a role for outreach strategists and program coordinators to build out the larger purpose of a regional food hub. New positions would be responsible for educating and mobilizing community support, and designing and implementing hub programs such as food business incubation, food donation, research and development, job training, and a hub-related retail market. While some require policy, planning, program coordination, or other skills, these positions could be filled by entry-level hub workers who have the skills and desire to advance with the support of internal training programs.</p>	<p>Food hubs provide essential infrastructure to support the growth of a sustainable regional food system. With a flexible structure that goes beyond distribution services to providing truly transformative opportunities, a food hub can be a site of creative innovation, skill sharing, and quality job training.</p>
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**RETAIL**

OCCUPATION	BASIC TRAINING & ENTRY-LEVEL WORK	CAREER LADDER OPPORTUNITIES	SUSTAINABLE BENEFITS AND PRACTICES
<p><b>Sales Workers (Cashiers, Baggers and Courtesy Clerks in Grocery Stores)</b></p>	<p>Sales workers in grocery stores are on the frontlines of helping customers find what they need. They interact directly with shoppers, answer questions and help locate items. Usually, no more than a high school degree is required for this occupation. Workers can be trained within a few days on company systems and working the register.</p>	<p>In a union environment, cashiers, baggers and courtesy clerks are usually given opportunities to take on more responsibility and supervise multiple check out stands or other sales workers. For further information about management positions in grocery stores, see below for Stock Clerks &amp; Order Fillers</p>	<p>Because they have direct contact, sales workers are best acquainted with community needs and preferences in terms of food choices, affordability and access. For example, cashiers help public benefit recipients validate their vouchers or utilize coupon savings. In cooperative and other democratic company structures, sales workers can lend their first-hand experience with customers to inform product selection, price points and offers.</p>
<p><b>Stock Clerks &amp; Order Fillers (Grocery Stores)</b></p>	<p>Stock clerks and order fillers work behind-the-scenes at grocery stores to stock shelves, place orders when items run out and arrange products in attractive displays. These workers sometimes specialize by department (i.e. produce, bulk items, frozen foods, cosmetics, etc.), depending on the size of the store. These workers are familiar with the store's inventory system, tracking the movement of goods and proper storage and temperature conditions for different products. Like with sales positions, a high school diploma is sufficient for entry level work.</p>	<p>Stock clerks and order fillers have the potential to advance into store management or department purchasing. Especially if the employee takes to learning the specifications associated with a particular department's products, s/he could advance to become a buyer for that department. Increasingly, supermarkets and grocery stores prefer to hire people with associates or bachelors degrees for management positions in marketing, logistics and supply chain management, inventory management, food safety and strategic planning. Applicable degrees are from marketing, business administration and food management programs.</p>	<p>The stock clerk, order fillers and management-level positions involved in placing orders, designing and stocking the store have notable influence on two fronts: (1) in their interaction with suppliers and (2) in what product placement within the store communicates about the food environment. Both are important locations for advancing equity and health. The departmental buyer is the person who negotiates with growers and distributors; these contracts are a key place to uphold fair prices, labor and environmental standards. The physical layout of the store and products prominently displayed also communicates a message to customers about the store's commitment to the health, well-being and safety of the community.</p>

<p><b>Food Preparation Workers (Deli, Bakery and Meat Counter Workers in Grocery Stores)</b></p>	<p>Generally, food preparation workers in grocery stores need a high school diploma to begin work. Training in sanitation and safe food handling is usually provided on the job. <i>For information about Bakers and Butchers, please see the Green Jobs Matrix for Food Processing.</i></p>	<p>Food preparation work could segue well into other culinary endeavors in restaurants, hotels or institutional cafeterias. The skills are not only transferrable but also serve as good preparation for community college, university or professional training in a variety of food industries.</p>	<p>Food preparation workers protect the health and safety of the consumer through mindful and sanitary practices. They also have first-hand experience with food waste at supermarkets. One significant way to reduce food waste at supermarkets is through the practices employed in the fresh food preparation services like the deli and meat counters.</p>
<p><b>Cooks and Kitchen Staff</b></p>	<p>Many people start careers in the restaurant industry as an untrained food preparation worker. The restaurant kitchen environment typically offers opportunities to advance one’s skills and take on more responsibility, from food preparer to line cook to chef. Culinary training does provide a more define career path. Programs vary from professional cooking schools, community colleges, trade schools and four-year universities. A federally-approved apprenticeship program is also available for union grade training simultaneously in the classroom and on the job for a few years.</p>	<p>Work experience in a restaurant or some other commercial kitchen facility could lead to a very rewarding career as a chef. Some chefs open their own restaurants or oversee many kitchens for a food service company. Others go on to distribute and test kitchen equipment and supplies or work as instructors.</p>	<p>In recent years, celebrity chefs like Jamie Oliver and Bryant Terry have inspired fresh conversation about the role of chefs as environmentalists and food and health justice activists. The chef’s role in procurement for the restaurant industry sets important trends in sustainable and local food markets. Additionally, socially aware chefs understand how food deeply connects to family, culture and community and, in honoring tradition, are creating healthy menus and recipes that are also culturally resonant.</p>
<p><b>Farmer’s Market Managers and Staff</b></p>	<p>Farmer’s markets are usually run by volunteer staff and one or two paid market managers. The manager is responsible to develop market rules and budget, establish vendor fee structure (if applicable), coordinate with the city around the venue and parking needs, coordinating volunteers and vendors and create programming like musical entertainment, cooking demos and crafts for kids. There are no set standards to get into this line of work. Any sort of program development experience or familiarity with supervising others is applicable, although the non-profit and municipal agencies that typically run farmer’s markets look favorably on previous experience with farmer’s markets, agriculture, nutrition, food assistance programs and community outreach. Cultural proficiency and effective communication is also necessary to interact with diverse customers, farmers, vendors and inspectors.</p>	<p>Though a farmer’s market manager usually works for a non-profit or other institution, s/he tends to have room to be entrepreneurial to expand the success of the market. Successful application to grants and awards could empower the manager to create cutting edge programming that maximizes the community development potential of the farmer’s market. In terms of career advancement and pay increase, a farmer’s market manager might go on to work at other institutions devoted to community development and food security like non-profits or government agencies. The market management experience could also parlay into managerial roles in other sorts of food retail outlets.</p>	<p>Though the principal activity at farmer’s market is the vending of fresh farm products, many markets serve as a public gathering space where music, arts, and culture thrive. Farmer’s markets are a key location for cultivating nutrition and culinary literacy, direct connection to the food system and neighborhood cohesion. Some market managers have been successful in offering business incubation services to growers and vendors to help them expand and improve their business, which supports the local community and regional food security.</p>

<p><b>CSA (Community Supported Agriculture) Coordinator, Customer Service &amp; Delivery Workers for Growers</b></p>	<p>Direct sales from farmer to consumer are giving rise to a variety of specialized customer service jobs, especially connected to CSA (Community Supported Agriculture) boxes. A CSA coordinator manages accounts with individual or institutional clients like restaurants and natural food stores. S/he keeps track of invoices, develops and promotes new products, coordinates volunteers and delivery staff, and communicates with customers through newsletters and online media platforms. Depending on the individual farm operation, the CSA coordinator might need to know how to use Excel, QuickBooks and computers in general. Formal education is not as important as experience with food sales, product development and food handling techniques or general customer service and marketing experience. Some growers are also hiring people to work at farmer’s markets or coordinate online vending to sell directly to customers.</p>	<p>Because this is an emerging field of work, the direct sales personnel for farms do not have a clearly defined career path. However, the type of skills required for coordinating a CSA program or managing direct sales operations for a farm can transfer into a variety of other work involving marketing, program development, accounting and business in all kinds of industries. The skills specific to food would allow a CSA coordinator to move into positions as a farmer’s markets manager, a produce buyer for a grocery store or a program manager for a food services company.</p>	<p>Because small growers lack the infrastructure or even yields required to fill orders for major retailers, CSA programs and other direct marketing mechanisms are the “bread and butter” of small and mid-size farm operations. CSA programs facilitate more seasonal eating, which promotes the ecological health and food security of a region. The consumer receives fresher, more nutritious food that traveled less distance than conventional food in supermarkets, which decreases the carbon footprint of the food system. CSA coordinators and other direct sales staff represent the necessary human resources required to ensure a regional food system functions efficiently.</p>
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WASTE			
OCCUPATION	BASIC TRAINING & ENTRY-LEVEL WORK	CAREER LADDER OPPORTUNITIES	SUSTAINABLE BENEFITS AND PRACTICES
<p><b>Waste collection driver, material mover, site laborer</b></p>	<p>Entry-level waste collection and material movers need no prior education or experience and receive on-the-job training in safety and hydraulic truck operation for those with on compost or recycling collection routes. A valid drivers license or State Commercial Driver license is required for drivers. Site laborers must safely meet physical activity requirements for heavy lifting and manual labor.</p>	<p>Opportunities for advancement to equipment installation, maintenance, service and repair work may emerge from apprenticeship or continuing education. Career pathways may be more accessible in smaller companies where entry-level tasks may be more diverse, and training and exposure to new skills more available.</p>	<p>By turning expanding the reach of compost collection, greater residential and commercial waste diversion rates can be achieved, and landfills and their pollution and GHG footprint reduced. Hybrid and electric fleets are improving energy efficiency in waste collection.</p>
<p><b>Industrial equipment installation, maintenance, service, and repair workers</b></p>	<p>These positions provide on-the-job training for those with a high-school diploma. Prior experience in utilities or wastewater treatment is desired for work in biogas machinery. Automotive or other equipment maintenance experience or training may be required.</p>	<p>There are significant advancement opportunities within occupations, as some have three to five pay scale positions depending on the size and number of workers. Advancement to machine technician can occur through apprenticeship, which involves more skilled equipment servicing and maintenance.</p>	<p>Industrial compost and biogas facilities such as methane or anaerobic digesters harness energy from food system waste and reduce GHG emissions. Industrial facilities can run on the energy produced and channel surplus energy to other supply other uses.</p>

<p><b>Compost lab/ greenhouse technician</b></p>	<p>These require a life science, biology, or horticultural background and experience with greenhouse growing, data analysis, and sampling. Technicians assist in sampling, quality testing and blending for the compost operation.</p>	<p>Lab experience, apprenticeship with a soil specialist, and/or some continuing education in soil science could lead technicians toward assistant soil scientist or other positions in product development. As skilled positions these jobs become more valuable with length of experience.</p>	<p>Organic composting revives an ecologically harmonious agricultural practice that diverts waste streams.</p>
<p><b>Soil Specialist, Assistant Soil Specialist</b></p>	<p>At least a bachelor's or equivalent experience in soil science is required, though graduate or doctoral degrees are emphasized for head soil scientists. These oversee compost soil quality, develop product blends, and problem-solve.</p>	<p>As these are highly skilled positions at entry level, career advancement occurs with experience, which becomes more valuable with time. Promotion from assistant to head specialist may occur with time, though continuing education increases these opportunities.</p>	<p>Industrial sized compost companies bring sustainable waste management and waste value recovery to scale by turning food waste and byproducts into a valuable and environmentally restorative agricultural soil product.</p>
<p><b>Compost technology and development planner</b></p>	<p>A graduate degree in engineering, chemistry or related science with a background in agricultural technology is required for technology and development planners, who work to upgrade and expand capabilities as this developing field is brought to scale.</p>	<p>Also highly skilled positions that increase in value with time and experience, planners can play an important role in designing facility operations and overseeing site management.</p>	<p>Research and development in composting technology yields solutions to a variety of organic waste streams and advancing opportunities for further innovation.</p>
<p><b>Bioenergy technician or engineer; Management, scientific and technical consultants</b></p>	<p>Entry-level technicians need a four-year degree in agricultural technology, Two specific programs currently exist to train technicians for work specifically in bioenergy facilities: a bioenergy major at Stanford University, and a bioenergy technology training program through the University of California Extension that will begin holding web-based classes soon. System designers and engineers require masters or doctoral degrees in mechanical or industrial engineering.</p>	<p>As mechanical technologies evolve, work is expected to grow for industrial engineers and mechanics. Senior technicians must be skilled in the mechanical area of generator operation and steam extraction. Innovations have grown in large-scale and centralized digester operations, as well as specialized water efficient models like Advanced Integrated Pond System with Methane Digester. Specialized degrees and certifications in energy efficiency and zero waste technology and development will have a leg-up in this emerging field.</p>	<p>Bioenergy generation from food scraps, farm waste, nut shells, discarded fish parts, and livestock manure is more than a resource management best-practice; it is a cutting edge clean energy science that innovates on the most basic ecological wisdom. It is a site of positive technological advancement and scientific advancement.</p>

# APPENDIX C

## GREEN JOB TRAINING PROGRAMS

Scattered all across the country are innovative job training programs that are sowing the seeds of a new green food system workforce. While some focus on training new farmers and incubating small farm businesses, other use food system projects like urban agriculture, local eateries, and organic produce distribution as education and training models for jobs in food. There is generally a focus on training youth, as well as increasing employment opportunities for historically disenfranchised and underemployed individuals with significant barriers to employment such as recent prison release, mental illness, chronic homelessness, substance abuse or addiction issues. These programs impart skills in food production and preparation, educating participants not only about the food system and health but also job readiness and money management. Beyond the job skills they provide, these programs are known to foster community development, model environmental sustainability, and increase healthy food access.

PROGRAM	DESCRIPTION	AT-A-GLANCE
<p><b>Agriculture and Land-Based Training Association—ALBA (Monterey Country, CA)</b>  <a href="http://www.albafarmers.org">www.albafarmers.org</a></p>	<p>Using its two organic farms as training sites, ALBA aims to “advance economic viability, social equity and ecological land management among limited-resource and aspiring farmers.” ALBA’s programs include: the six-month Farmer Education Program (PEPA) trains participants how to operate a small farm business; Small-Farm Incubator provides land leases and equipment access for PEPA graduates on their 110-acre Rural Development Center (Salinas, CA); through a partnership with community development organizations, the Salinas and Pájaro Valleys Small and Micro-Business Initiative provides business education, incubation and assistance, as well as policy education and advocacy for aspiring food businesses; and a Community Food Systems Program that has improved both food access for residents and market access for new farmers through its 9 new farmer’s markets and farm stands; and its ALBA organics produce distributor. ALBA’s successes are significant rural development achievements, including 37 PEPA graduates, 19 new farm businesses and 103 new jobs, \$4.5 million in direct private investment in small farm business, and more than \$1.75 million in fresh produce sales from the ALBA Organics distributor to families, schools, and universities.</p>	<p><b>Training Site:</b> 110-acre Rural Development Center organic farmland.</p> <p><b>Target Population:</b> low income, limited-resource aspiring rural farmers, primarily from Latino farm worker communities.</p> <p><b>Skills:</b> small farm business development and incubation, organic produce distribution, policy education and advocacy.</p> <p><b>Job Placement Area:</b> small farm owners, produce distributors and retailers.</p> <p><b>Successes:</b> 37 graduates, 19 new farm businesses and 103 new jobs, \$4.5 million in direct private investment in small farm business; \$1.75 million in fresh produce sales from the ALBA Organics distributor to families, schools, and universities.</p>
<p><b>City Seeds Urban Farm at Gateway Greening (St. Louis, MO)</b>  <a href="http://www.gatewaygreening.org">http://www.gatewaygreening.org</a></p>	<p>Now in its second season, the job training component of this non-profit urban farm project is called GO! Green and targets formerly incarcerated, individuals with barriers to employment and those in recovery from substance abuse for training in food production. Participants gain skills in all aspects of urban farming, seedling cultivation, landscaping, water and waste management, holistic environmental stewardship and retail and customer service experience at their weekly farmer’s market stand. Participants also receive job readiness and case management services. Long-term partnerships with local businesses allow trainees to easily move into employment with local landscaping firms, nurseries, and greenhouses, as well as grocery store and produce departments. The projects boasts 156 participants to date with a 65% job placement rate and over 26,000 lbs of locally grown food produced, of which a third is donated to area shelters and food pantries.</p>	<p><b>Training Site:</b> 2.5 acre urban farm.</p> <p><b>Target Population:</b> Formerly incarcerated, unemployed and underemployed with barriers to employment.</p> <p><b>Skills:</b> sustainable urban farming, seedling cultivation, landscaping, water and wastewater management, produce retail</p> <p><b>Job Placement Area:</b> landscaping, nurseries, greenhouses, grocery stores, produce departments</p> <p><b>Successes:</b> 156 participants, 65% job placement, 26,000+ lbs total produce yield, 8,000+ lbs donated</p>

<p><b>The Bread Project (San Francisco Bay Area, CA)</b> <a href="http://www.breadproject.org">www.breadproject.org</a></p>	<p>Promoting self-sufficiency and career advancement for low income, disenfranchised individuals and those with barriers to employment, The Bread Project participants choose between two job training tracks in food service, where they gain hands on experience in culinary, barista, and customer service skills through work in the program's Berkeley café; or bakery production, teaching baking skills and good manufacturing practices at their Emeryville bakery facility. Over the last decade the project has placed 500 of its 700 total participants, claiming an 83% job retention rate.</p>	<p><b>Training Site:</b> café and catering kitchen, Berkeley; 8,000 sq ft bakery facility, Emeryville.</p> <p><b>Target Population:</b> low income from diverse ethnic, social, and economic backgrounds with barriers to employment.</p> <p><b>Skills:</b> <b>food service</b>—culinary, barista, customer service; <b>bakery</b>—production, food manufacturing; job readiness.</p> <p><b>Job Placement Area:</b> food service (restaurant and catering) and bakeries.</p> <p><b>Successes:</b> 700 participants, 500 job placements, 86% graduation rate, 74% employment rate, 83% retention rate.</p>
<p><b>Growing Home (Chicago, IL)</b> <a href="http://www.growinghomeinc.org">www.growinghomeinc.org</a></p>	<p>Recognizing the barriers to living-wage employment for homeless individuals, Growing Home began in 1992 as a transitional employment program to build life and job skills through organic agriculture while increasing fresh food access to residents of Chicago. The program pays participants for their seven-month internship at the programs three USDA Certified-Organic sites—a 10 acre organic farm outside the city, a 2/3 acre high-yield urban organic greenhouse, and small urban vegetable garden and apiary beekeeping site. Growing Home's "social enterprise" organic agriculture business funds the employment program through sales at its farmer's market stand and Community Supported Agriculture (CSA) produce box program. Interns learn skills needed for a full season of organic agriculture work, marketing and sales, and receive personal money management and other life skills, and gain free access to GED-preparation courses.</p>	<p><b>Training Site:</b> Les Brown Memorial Farm—10 acre organic farm; Wood Street Urban Farm—2/3 acre high-yield organic greenhouse; Su Casa Market Garden and Urban Apiary.</p> <p><b>Target Population:</b> formerly incarcerated or homeless individuals; low income with barriers to employment.</p> <p><b>Skills:</b> full-season organic agriculture, farmstand marketing and sales, nutrition education, job readiness, life skills, personal money management; GED-preparation.</p> <p><b>Job Placement Area:</b> Transitional employment program provides seven months of stable employment and skill-building for re-entry into the job market. Growing Home works with participants to land full time jobs.</p> <p><b>Successes:</b> 100 program participants since 2001, 65% have stable jobs, 90% now have stable housing farms made \$108,000 in produce sales in 2009.</p>
<p><b>Massachusetts Ave Project's "Growing Green Program" (Buffalo, NY)</b> <a href="http://www.mass-ave.org">www.mass-ave.org</a></p>	<p>The Growing Green program began in 2003 as an urban agriculture education project for Buffalo-area youth. The Massachusetts Ave Project's (MAP) Urban Youth Farm includes a straw-bale greenhouse, 1000-gallon water catchment system, and Buffalo's first aquaponics system. The program teaches youth urban agriculture skills in vegetable production, composting, and other life and career skills. There is also a focus on healthy eating, local food access issues, supporting the local farm economy, and social enterprise. In 2006 the program began Growing Green Works, a locally owned business project that the youth run and manage. The youth produce and sell two food products, Amazing Chili Starter and Super Duper Salsa, with farm-grown ingredients, and market them in area stores, including major grocery chains. They do product demonstrations at retail sites, and learn marketing skills to expand distribution. They also learn about product development and are researching new products.</p>	<p><b>Training Site:</b> Urban Youth Farm including vegetable beds, straw-bale greenhouse, 1000-gallon water catchment system, aquaponics.</p> <p><b>Target Population:</b> local youth.</p> <p><b>Skills:</b> urban agriculture, aquaponics, composting, social enterprise, micro-processing, product development, marketing.</p> <p><b>Job Placement Area:</b> urban agriculture, food processing, product development.</p> <p><b>Successes:</b> Youth-run business Growing Green Works.</p>

<p><b>Growing Power (Milwaukee, WI and Chicago, IL)</b> www.growingpower.org</p>	<p>Growing Power is one of most well-known and successful sustainable urban agriculture programs in the country, operating in Milwaukee and Chicago, with affiliated Regional Outreach Training Centers hosted by non-profits in nine other states. The Community Food Center, which serves as the organization's Milwaukee headquarters, is a model for how community food systems can take root through a variety of community food projects. Throughout the year participants come from all over the country to attend workshops where they learn from demonstration projects in high-yield urban farming, beekeeping, composting, vermicomposting (worm composting), aquaponics, year-round greenhouse growing, hoop houses, and livestock raising, as well as community project design that teaches people to identify local assets and build their own successful community food projects. Growing Power also has a five-month Commercial Urban Agriculture training program where participants learn all the business and farming skills to begin their own urban farm. Additional Growing Power projects include gardens and urban farms throughout Milwaukee and Chicago, a Farm-to-City Market Basket produce delivery program, a weekly farmer's market stand, and the Rainbow Farmer's Cooperative, a seller and producer coop that markets small farmer's produce and provides training and technical assistance. It is difficult to measure Growing Power's impact because they have provided education, training, and inspiration for so many throughout the country.</p>	<p><b>Training Site:</b> Milwaukee Community Food Center (headquarters), dozens of community and school gardens in Chicago and Milwaukee, 40-acre rural farm site in Merton, WI, Regional Outreach Training Centers hosted by non-profits in Arkansas, Kentucky, Colorado, Minnesota, Mississippi, Florida, Michigan, Virginia, and Georgia.</p> <p><b>Target Population:</b> schools, universities, farmers, activists, community members, government agencies.</p> <p><b>Skills:</b> high-yield urban agriculture, aquaponics, beekeeping, livestock raising, composting, vermicomposting (worm compost), hoop house construction, year-round greenhouse growing, myoscaping, renewable energy, and community project design.</p> <p><b>Job Placement Area:</b> urban farmer, community food system leader.</p> <p><b>Successes:</b> 3,500 individuals receive tours of the Community Food Center each year.</p>
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## Additional Programs and Resources:

National Sustainable Agriculture Information Service: Provides a directory of Sustainable Farming Internships and Apprenticeships in North America. **For more information:** <http://attra.ncat.org/attra-pub/internships/>.

Farm and Garden Apprenticeship Program at the University of California-Santa Cruz Center for Agroecology: Offers practical and academic training and apprenticeship in organic agriculture, gardening, ecological horticulture, and agroecology. **For more information:** <http://casfs.ucsc.edu/apprentice-training>.

Beginning Farmer and Rancher Development Program of the USDA: Funds programs that “develop and deliver curriculum to help beginning farmers and ranchers to establish, build and manage successful farm and ranch enterprises.” **For more information:** <http://www.nifa.usda.gov/fo/beginningfarmerandrancher.cfm>.

The Intervale Center, Burlington, Vermont: Provides farm incubation and business development assistance and training for new organic farm businesses. **For more information:** [http://www.intervale.org/programs/agricultural\\_development/intervale\\_farms.shtml](http://www.intervale.org/programs/agricultural_development/intervale_farms.shtml).

<sup>1</sup>See for example:

Apollo Alliance & Green For All. (2008) *Green-Collar Jobs in America's Cities: Building Pathways out of Poverty and Careers in the Clean Energy Economy*.

Yen Liu, Y. & Keleher, T. (2009) *Green Equity Toolkit: Standards and Strategies for Advancing Race, Gender and Economic Equity in the Green Economy*. Applied Research Center.

<sup>2</sup> Warren, D. & Dubb, S. (2010) *Growing a Green Economy for All: From Green Jobs to Green Ownership*. The Democracy Collaborative. University of Maryland.

<sup>3</sup> Bernstein, L. et al. (2007) *Climate Change 2007: Synthesis Report Summary for Policymakers. An Assessment of the Intergovernmental Panel on Climate Change*. Intergovernmental Panel on Climate Change.

<sup>4</sup> Steinfeld H, Gerber P, Wassenaar T, Castel V, Rosales M, and de Haan C. (2006). *Livestock's long shadow: environmental issues and options*. Rome: Food and Agriculture Organization of the United Nations, p. xxi.

<sup>5</sup> U.S. Environmental Protection Agency. (2009) *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007*. Available from: <http://www.epa.gov/climatechange/emissions/usinventoryreport.html>

<sup>6</sup> Hill, H. (2008) *Food Miles: Background and Marketing*. ATTRA National Sustainable Agriculture Information Service. National Center for Appropriate Technology. Retrieved on November 1, 2010 from [http://www.leopold.iastate.edu/research/marketing\\_files/foodmilespathways.html](http://www.leopold.iastate.edu/research/marketing_files/foodmilespathways.html)

<sup>7</sup> Canning, P., Charles, A. Huang, S., Polenske, K. & Waters, A. USDA. (2010) *Energy Use in the U.S. Food System*. Economic Research Service. This study estimates that food accounts for 15.7% of all energy use in the U.S.

Pimentel, D., Williamson, S., Alexander, C., Gonzalez-Pagan, O., Kontak, C. & Mulkey, S. (2008) *Reducing Energy Inputs in the US Food System*. Human Ecology 36, 459-471, DOI: 10.1007/s10745-008-9184-3. This study put the food system's share of total energy use at 19%.

<sup>8</sup> Pimentel, D. et al. (2008)

<sup>9</sup> USDA Economic Research Service. (2004) *Irrigation and Water Use*. Retrieved on November 11, 2010 from: <http://www.ers.usda.gov/Briefing/WaterUse/>.

<sup>10</sup> U.S. Environmental Protection Agency. (2005) *Protecting Water Quality from Agricultural Runoff*. Retrieved on November 11, 2010 from: [http://www.epa.gov/owow/NPS/Ag\\_Runoff\\_Fact\\_Sheet.pdf](http://www.epa.gov/owow/NPS/Ag_Runoff_Fact_Sheet.pdf)

<sup>11</sup> Montgomery, David R. (2007) *Dirt: The Erosion of Civilizations*. Berkeley, CA: University of California Press. p.174.

<sup>12</sup> U.S. Environmental Protection Agency. (2010) *Carbon Sequestration in Agriculture and Forestry*. Retrieved on November 11, 2010 from: <http://www.epa.gov/sequestration/index.html>.

<sup>13</sup> Food And Agriculture Organization of the United Nations. *Climate Change and Food Security: A Framework Document*. Retrieved on November 11, 2010 from: [www.fao.org/forestry/15538-0-0.pdf](http://www.fao.org/forestry/15538-0-0.pdf).

<sup>14</sup> USDA Economic Research Service. (2009)

<sup>15</sup> Treuhaft, S. & Karpyn, A. (2010)

<sup>16</sup> See for example:

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