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New England Food Vision: Healthy Food for All, Sustainable Farming and Fishing, Thriving Communities

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A New England Food Vision

- *Healthy Food for All*
- *Sustainable Farming and Fishing*
- *Thriving Communities*

A *New England Food Vision* is a story about the future of our region. Because it centers on food, it's a complicated story: it not only involves many characters, settings, and facts, but it has multiple endings—or, more precisely, alternative futures. It's a story that stretches back to the foodways of Native peoples who were devastated by European colonization and extends through the present into the future. It's a story that generates questions and choices as New Englanders decide what's important for their immediate and long-term food futures.

This vision is bold in scope and aspiration. It reflects a point of view informed by two principles: first, food is a powerful determinant of all aspects of quality of life the world over, including New England. Second, New Englanders can and should pursue a future in which food nourishes a social, economic, and environmental landscape that supports a high quality of life for everyone, for generations to come. So this vision is all about our choices and the conversation, learning, and purposeful decision-making in which we as a region can participate.

The story of regional collaboration in pursuit of shared food system goals defines Food Solutions New England (FSNE), a network effort to engage in dialogue, learning, and decision-making that will enable us to have a regional food system that works for all New Englanders, of every race—now and into the future. *A New England Food Vision* is a critical element in this story of regional collaboration. An early version was presented at the first FSNE New England Food Summit in 2011, where delegates from across the region asked that it be developed further. Over the next three years, the evolving vision figured prominently in a series of regional and state summits, briefings, network design meetings, and workshops that provided important feedback and built strong connections across FSNE and other networks committed to ensuring an accessible and sustainable food system. Philanthropic funders, nonprofit organizations, businesses, academic institutions, and government agencies are coalescing around the shared values of food justice, racial equity, public health, and ecological integrity. Creative and imaginative analysis, as *A New England Food Vision* illustrates, is illuminating pivotal public policy issues that can either stifle or nurture the seeds of a sustainable food future. The emerging network is eager to facilitate collaboration, innovation, equity, and entrepreneurship across the food system.

So where do we go from here? *A New England Food Vision* is neither a prediction nor a plan. Its care and provision for the future are rooted in clearly articulated values and an ethic of social justice and ecological responsibility among a growing number of diverse food system stakeholders who are dedicated to building the trust that is the lifeblood of collaboration. *A New England Food Vision* is just beginning and will continue to be a dynamic element of a project that will live on. FSNE is committed to supporting the dialogue and a continuous learning process that will feed the reshaping of our visions and aspirations and the character of the collaborations we choose to embrace.

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food solutions new england

For Russell Libby, who inspired us to think deeply about a future in which good food is common fare, and encouraged us to plant and build that future, apple by apple, stone by stone.

"Over decades our vision is clearly
just a small part of the picture, and how
We place each stone determines what might last."

— from "Looking Forward" by Russell Libby

A New England Food Vision

Healthy Food for All
Sustainable Farming and Fishing
Thriving Communities

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Introduction

A *New England Food Vision* describes a future in which New England produces at least half of the region's food—and no one goes hungry. It looks ahead half a century and sees farming and fishing as important regional economic forces; soils, forests, and waterways cared for sustainably; healthy diets as a norm; and access to food valued as a basic human right.

New England is a place of forests and hills, cities and villages, farms and seaports, colleges and high-tech companies, a place where history and modern life are intimately connected. Farming and fishing were once at the heart of the region. Today, service industries, technology, medicine, tourism, and education are driving economic forces, and development dominates a growing part of the landscape. Still, the enduring presence of dairy farms, vegetable stands, sugar houses, and fishing boats testifies to the cultural heritage that underlies our landscape and economy.

Agriculture and fishing have waxed and waned in the past four centuries. New England has gone from a largely wooded to a predominantly agricultural landscape, then returned to forest. The amount of land producing food today is very small—only about 5% (less than 2 million acres) of a region with almost 15 million inhabitants. Commercial fishing, once a major industry, now struggles to survive. Food production once engaged most New Englanders but now is a small component of the regional economy, occupying only a fraction of the population.

Serious problems plague New England's food system. Consumers purchase excessive amounts of refined grains, fats, and sugars and too few fruits, vegetables, and whole grains. Heart disease, diabetes, obesity, and similar health problems shorten lives. Many distrust the safety of our food and feel disconnected from its sources. About 90% of our food comes from outside the region (as measured by acreage footprint—see Figure 4), brought here by a global food system that produces abundant food but also undermines the planet's soils, waters, and climate. Despite food abundance, as many as 10–15% of New Englanders regularly do not have enough to eat (Coleman-Jensen et al. 2013). Collectively, these factors constitute a food-related crisis.

There is hope. The decline of farms and farmland acreage has bottomed out since 1970, and there has been a recent upturn toward more (mostly small) farms (USDA 2009a). Many New Englanders strive to eat local seafood and support local farmers: "No Farms, No Food" bumper stickers are ubiquitous. The region's remaining farmers have shown skill, innovation, and determination, while nonprofit organizations and state programs work together to protect farmland and support local agriculture.

A New England Food Vision proposes changes in food production, distribution, and consumption reaching from the most rural areas to the densest cities—across the entire food system (Figure 1). It envisions New Englanders in 2060 eating more diverse and healthier foods than today, with three times as much land (15% of the region, or 6 million acres) producing food: several hundred thousand acres in and around cities devoted to intensive production and several million acres of rural farmland abandoned since World War II supporting crops and livestock.

This expansion leaves 70% of the region forested, with adequate room remaining for clustered "smart growth" and green development (Foster et al. 2010). In this Omnivore's Delight scenario, the region grows most of its vegetables; half of its fruit; some of its grain and dry beans; and all of

A New England Food Vision proposes changes in food production, distribution, and consumption reaching from the most rural areas to the densest cities—across the entire food system.

its dairy, beef, and other animal products—about half of New Englanders' food.

If more severe economic and environmental conditions should demand more food production and greater changes in food consumption (a scenario we call Regional Reliance), New England *could* produce more than two-thirds of the food required. With a large urban population, cold winters, and limited farmland, complete local food self-reliance is not a realistic goal. There is not enough prime cropland in New England to provide the needed grain, vegetable oil, sugar, and other basic commodities, and many desirable foods such as oranges, bananas, coffee, and cocoa cannot be grown here. *A New England Food Vision* seeks to strike a balance between foods that could reasonably be produced in New England and those that are best brought from elsewhere. Both are crucial to a healthy, sustainable food system.

A New England Food Vision is neither a prediction nor a prescription. It is not a specific plan. It explores what could happen if society were to commit to supporting sustainable food production in New England, improving New Englanders' diets, and ensuring the right to healthy food for all. The result could be an attractive pastoral landscape coexisting with extensive woodlands and clean waterways, surrounding vital, green suburbs and cities. The result could also be a population enjoying healthy, nutritionally sound diets, thus reducing enormous health care and other social costs.

Realizing this vision will reap large benefits for the region in economic well-being, health, and environmental quality. But it is ultimately a matter of choice: the choices of thousands of property owners about how to manage their land, millions of consumers about how to eat, and all New Englanders, collectively, about the policies that support an equitable and resilient food system.

Figure 1. The New England Food System

A food system includes how food is produced, consumed, and disposed of in all its material and social dimensions. Food is produced on the land and in the ocean, processed into forms in which it is distributed to consumers at markets, stores, and restaurants, prepared, and eaten. Waste at any stage can become a pollutant or can be recycled. Health in one part of the system can be linked to health in other parts. In *A New England Food Vision*, a holistic food system is guided by four core values: everyone has access to adequate food, everyone enjoys a healthy diet, food is sustainably produced, and food helps build thriving communities.

New England Farming, Fishing, and Food: A Historical Perspective

The history of food production in New England illustrates some unsustainable practices but also provides positive examples for a future food system that produces an abundance of food while maintaining a high standard of environmental stewardship.

Eating local is not new to New England. From precolonial times well into the 19th century, New England had food systems based on local production, with most people involved in producing food.

Native inhabitants of the region ate a wide variety of indigenous plants and animals. European settlers relied on farmed crops and livestock, creating a distinctive New England culture, landscape, and way of eating—plain but hearty fare marked by regional specialties such as baked beans, salt cod, maple sugar, and apple pie. By the 20th century that world was fading, while fresh waves of immigration introduced new foods and ways to prepare them, greatly enriching the food culture.

Selling, preparing, and serving food are still economically significant, but few residents now grow or harvest food, roughly 90% of which is produced elsewhere. Today the foods most New Englanders eat differ little from those consumed in the rest of the United States.

Farming and fishing in New England have passed through several distinct periods. The forces that have changed the region's food system illuminate both limits and opportunities for the future. The history of food production in New England illustrates some unsustainable practices but also provides positive examples for a future food system that produces an abundance of food while maintaining a high standard of environmental stewardship.

BEFORE EUROPEAN SETTLEMENT

The Native people of the region certainly ate locally. They were by all accounts healthy and robust people who enjoyed a rich and varied diet. Most lived along the southern coast and in river valleys, where they grew corn, beans, squash, and a variety of small-seeded crops. Smaller northern and upland groups did not farm. All of the region's Native people foraged seasonally for nuts, tubers, berries, and, on the coast, the occasional stranded whale. They hunted deer, waterfowl, and other game and harvested freshwater and saltwater shellfish and fish, including migrating herring and salmon. As far as we know, all ate when food was abundant and fasted when it was not.

Within a few miles of coastal and riverside villages, some Native groups used fire systematically to prepare planting grounds and increase production of many foraged foods. Most of New England, however, especially to the west and north, was deeply forested and seldom burned (Chilton 2001, Cronon 2003, Patterson and Sassaman 1988, Williams 1992).

This way of life appears to have been ecologically sound and resilient. It persisted for thousands of years and supported about 100,000 people before European contact—less than 1% of New England's population today

(Bragdon 1999, Donahue 2004, Salisbury 1982, Snow 1980). Native people granted New England important food legacies: corn, beans, pumpkins, cranberries, blueberries, maple sugar, and the clambake. Native groups continue to inhabit New England and contribute to the region's evolving traditions of land stewardship.

1600–1790

By the end of the colonial period, most New Englanders were settlers of European, primarily English, descent. They were eating locally, but in a different way than the Native people. The regional population had risen 10-fold, to about 1 million, and was overwhelmingly agrarian. Most settlement was in southern New England, though it was pushing northward rapidly (Jaffee 1999).

Colonial farming was mostly aimed at household subsistence and exchange with neighbors. It was sustainable though not high-yielding by modern standards. When crops were poor, people went hungry.

Farmers grew corn, rye, beans, and potatoes; kept a few sheep and pigs; and tended substantial orchards—primarily for hard cider, the everyday beverage of choice (Clark 1992, Donahue 2004, McMahon 1985). Their main agricultural focus was on hay and cattle, which provided milk, meat, manure, leather, and muscle to pull carts and plows. Farmwives kept kitchen gardens and flocks of poultry and processed the daunting flow of food and fiber streaming from the land into the household economy (Ulrich 1991).

Only a small farm surplus was sent to market, mostly cattle and wood products. Food imports were limited to sugar, rum, tea, coffee, nutmeg and other spices, and a small amount of wheat flour for the wealthy (Friedmann 1973).

Commercial fishing off Newfoundland and New England had become well established by 1600, with Norwegian, Basque, Portuguese, English, and French fishing boats harvesting and salting tons of cod and selling it in the West Indies and throughout Europe (Fagan 2006). The vigorous and varied inshore fishery supplied an important source of protein to coastal settlements, and whaling was becoming a key industry.

This was an era of living within local ecological limits by relying on a sustainable system of mixed husbandry and fishing. New England supported relatively few people at a very rudimentary standard of living (Donahue 2004).

1790–1860

By the Civil War, the population of New England had tripled to about 3 million. The region had begun to industrialize rapidly, and more and more people were living in cities. There were great disparities in access to food based on economic status, and malnutrition was becoming widespread among the poor. The indigent were fed at county and municipal poor farms; by all accounts they did not eat well (Donahue 2007).

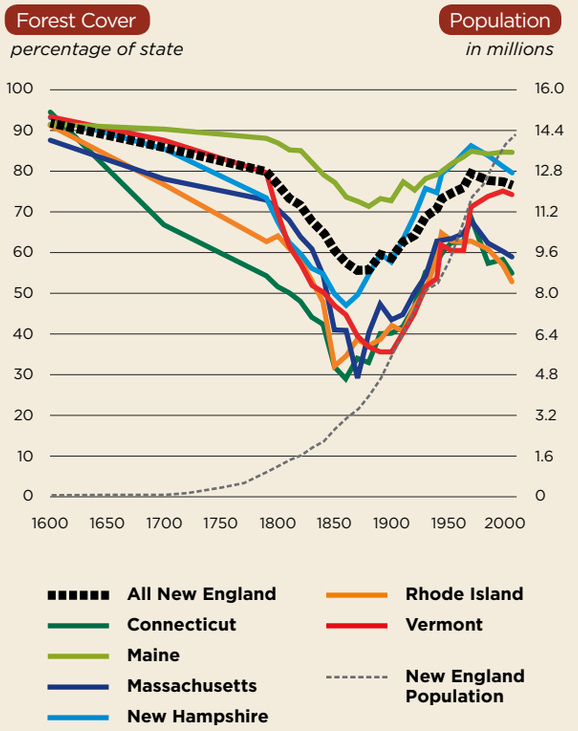
Forest clearing was near its peak: well over half the landscape in southern New England was farmland, and almost as much in northern New England. The forest in the far north, especially in Maine, was being heavily logged but was never cleared for farming (Figure 2).

This dramatic clearing was driven not only by population growth but also by a decisive shift to commercial farming that historians call the "market revolution" (Kulikoff 1989). Extensive land use (large expanses at low productivity) supplied rapidly growing urban and industrial markets. Most of the cleared land was not intensively cultivated but was used as pasture. Butter, cheese, and beef dominated southern New England, while the wool boom sheared the trees from many of the region's northern hills.

This agricultural explosion was not environmentally sustainable. Too much forest was lost, stream flow was disrupted, and the hills were soon covered with degraded pastures growing back up to steeplebush, juniper, red cedar, spruce, fir, and pine (Donahue 2007, Soll 2009). In maximizing production, farmers had pushed the land to its limit. Too much local farming can overclear and abuse the land—an important lesson to draw from history.

New England fisheries greatly increased harvest volume during this period—particularly of mackerel and cod from Georges Bank—to supply booming markets in the region and beyond (McKenzie 2010). Food imports were rising (especially wheat flour and feed grain), though New England remained mostly self-reliant.

Figure 2. New England Forest Cover



Forest cover dropped slowly as farmland was cleared during the colonial period, especially in southern New England. Forest fell precipitously with the expansion of commercial farming in the first half of the 19th century, then recovered as farming concentrated and marginal land was abandoned. Trees continued their comeback through most of the 20th century as New England farming declined. In the past few decades forest has begun to disappear again, this time in the face of development.

Top: This diorama from the Fisher Museum at Harvard Forest shows pioneer farm clearing in central Massachusetts in the 18th century.

Middle: New England farming at its peak in the mid-19th century. 75% or more of the land in many parts of the region was cleared, primarily to provide pasture and hay for cows and sheep.

Bottom: By the late 19th century the most marginal land was returning rapidly to forest. White pine invaded many pastures before the cows had even left them.

1860–1910

By World War I the population of New England had reached 7 million (about 50% of today's population) (US Census Bureau 2002). Most people lived in cities, and many were recent immigrants. Disparities in access to food, the existence of poor farms, and the importance of private charity in feeding the poor continued.

The earlier expansion of farmland had reversed. Farmers had abandoned the most marginal lands to trees. Regrown forest covered about half of New England's landscape (see Figure 2). This was not a period of agricultural decline, but rather of intensification. Although farm acreage was contracting (US Census Bureau 1913), farm production was increasing in value. Farmers responded to urban demand by focusing on crops they called "concentrated products"—milk, poultry, produce, and fruit.

At the same time the region brought in much of its meat and almost all of its grain. Dairy production soared as cows were fed more silage and imported grain (Soll 2009). Highly productive market gardens surrounded the cities, recycling urban wastes such as stable manure. New England farmers provided a significant but selective part of the food for a large urban population—another important historical lesson (Donahue 2007).

In this period an expanding fishing fleet landed millions of fish. Associated businesses, including shipbuilding and fish processing, flourished (Murawski 1990s).

1910–1945

By World War II the population of New England had risen to about 9 million, 65% of what it is today. Poor farms vanished after the advent of Social Security in the 1930s, although soup kitchens and food pantries continued to feed the poor (Britten and Brash 1998).

Farmland covered 17% of the landscape overall (see Figure 3): the southern New England states remained about 20–25% cleared; pastoral Vermont (40% farmland) was diverging from heavily reforested New Hampshire (13%) and Maine (10%) (US Census Bureau 1946).

New England food production declined after 1910 with the rise of oil-driven agriculture and long-distance transportation, which undermined regional specialties such as vegetables and fruit. The era between the wars saw continued recovery of forest and consolidation of farming, but much of the older farm economy and rural culture persisted, particularly dairy, with milk production steadily increasing (Donahue 2007).

Meanwhile, Americans were consuming fewer calories per person, more milk, and a greater variety of fruits and vegetables (fresh, canned, and frozen) as these became available year-round (Levenstein 2003, USDA 2013b). World War II victory gardens marked an important high point of home gardening, even in urban areas (Pollan 2008). The regional food system was declining but not yet collapsing.

In the fishing fleet, motorized draggers and gillnetters replaced sailboats. Small net sizes improved catch efficiency and increased landings but at the long-term expense of fish populations. Freezing and canning made fish widely available inland, and much of the catch was exported from the region (Murawski 1990s).

1945–PRESENT

Today New England has a population of about 14.5 million. Despite governmental safety nets, 10–15% of New Englanders do not have enough to eat, and food pantries report growing numbers of people in need (Coleman-Jensen et al. 2013, Feeding America 2014).

Farmland has been reduced by both forest regrowth and development (see Figure 3a). It now covers less than 2 million acres, or 5% of the regional landscape (USDA 2009a). Because of high land values and competition from large-scale agriculture elsewhere, New England's food production has declined, except for dairying in Vermont, which increased production with far fewer farms and cows until 2000; cranberries in Massachusetts; and wild blueberries in Maine. Today New England produces about half of the dairy products consumed in the region, less than half of the vegetables (mostly sweet corn and potatoes), and only a fraction of most other foods (see Figure 4).

Offshore factory ships in the 1960s and 1970s decimated fish populations and led in 1983 to a 200-mile offshore limit for foreign fishing. This created a rush for

places in the fishery and further domestic overharvesting (Murawski 1990s). Many coastal fish populations declined steeply.

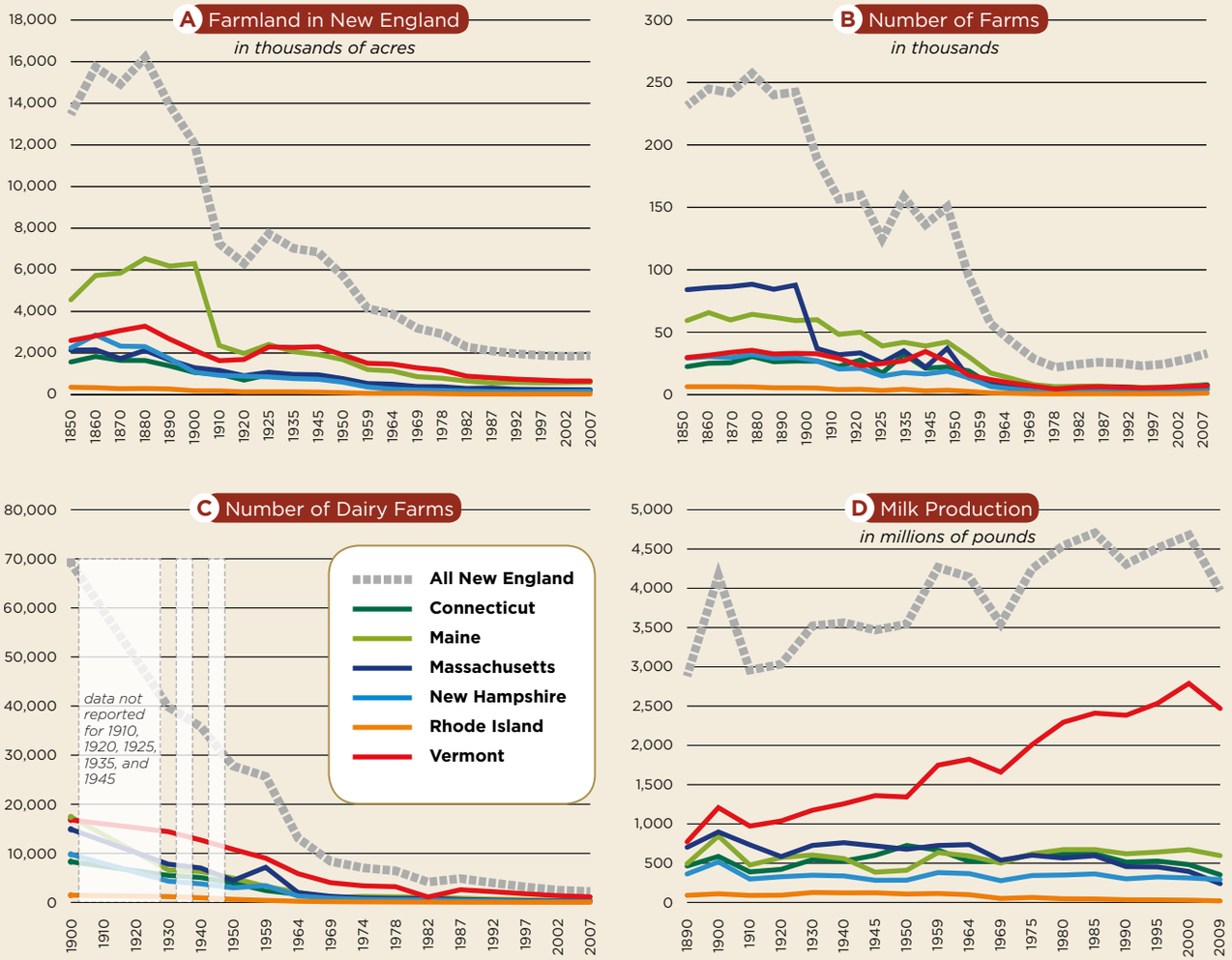
Congress amended the Magnuson-Stevens Fishery Conservation and Management Act in 1996 to strengthen protection of US fisheries. With fishermen's cooperation with the new regulations, half of commercial fish stocks that by 2000 were designated as "overfished" have since recovered. Others, including cod and winter flounder, have failed to respond and remain severely overfished (NMFS 2013a, 2013b; Sewell et al. 2013). The prospects for survival of commercial fishing in New England are still questionable, in spite of boom cycles in lobstering in Maine and promising shellfish aquaculture in some coastal harbors (Buchsbaum et al. 2005, Steneck et al. 2011).

During the last half century, many New Englanders' dietary patterns have exceeded national guidelines for sodium, saturated fats and transfats, added sugars, alcohol, and calories. Many eat less than recommended amounts of fruits and vegetables, whole grains, foods rich in vitamin D and calcium, healthy oils, and seafood. Meat and poultry are typical sources of protein, whereas legumes, nuts, and seeds are healthy plant-based alternatives. The causes of health problems such as obesity, type 2 diabetes, and heart disease are complex, but they run closely parallel to the rise of a national food system designed to maximize production and consumption of food as a cheap commodity (Nestle 2013).

Despite great challenges, the region's farmers have proven tenacious, and state governments, land trusts, and farm organizations have staunchly supported them. Fishermen, researchers, and fisheries managers are working together to restore coastal fisheries. New England has also seen the birth of a strong sustainable agriculture and food justice movement since the 1970s. The recent rise in successful community-supported agriculture (CSA) and market garden operations has stemmed the loss of farms and farmland. Community-supported fishing networks are popping up as well, and there is mounting public interest in local foods (Donahue 1999, Martinez et al. 2010).

This combination of entrepreneurial spirit and a groundswell of public support suggests many possibilities for sustainable local food production, improving New Englanders' diets, and providing healthy food for all.

Figure 3. Decline in New England Farming



Broad trends in New England farming during the 20th century are clear, despite some noisy data because of repeated changes in US Agricultural Census categories, (a) Farmland fell dramatically from a peak in the late 19th century but stabilized for several decades between the World Wars at 6–8 million acres, or 15–20% of the region. It then slid again before holding at 2 million acres (5% of the region) for the past few decades. (b) The number of farms followed a similar pattern, with even a slight rise in recent years. (c) Dairy farms consolidated sharply from almost 69,000 in 1900 to just over 2,000 in 2007, mostly in Vermont—but at the same time, (d) dairy production rose slowly through most of the century.

Business as Usual:
The Current Acreage Footprint of New England Food Consumption

Today it takes an estimated 16 million acres to feed New England's 14.5 million people. In other words, over 1 acre per person is needed to grow all the food the region consumes. With less than 2 million acres of active farmland, New England produces about 12% of the amount of food it consumes. This acreage footprint estimate is derived not by tracking every morsel that flows in and out of New England but by making a series of calculations. First, food availability data are used as a proxy for the amounts of various foodstuffs (vegetables, fruits, grains, dairy, meats, and so forth) consumed in New England (USDA 2013b). Next, the farm acreage needed to produce that food is calculated, making allowances for waste along the way from the fields to our mouths. This total acreage footprint is then compared to farmland acreage and food production within New England (Busby 2006, Peters et al. 2007, Peters et al. 2009, USDA 2009a) (Figure 4).

In acreage terms, New England grows just under half of its vegetables, mainly potatoes and sweet corn; about one quarter of what it consumes in fruit; and over half of its dairy products—more of its fluid milk but less of its butter and cheese. New England fishermen catch almost as much seafood as New Englanders consume, though large exports on one hand and large imports on the other complicate the picture. Beyond that, the region supplies little of its own needs. About 5% of beef consumption (mostly culled dairy cows) and small amounts of poultry and pork are produced in New England, but the feed grain for these animals is almost entirely imported, so their acreage footprint falls outside the region. Finally, New England produces only a fraction of its cereals, beans, vegetable oils, sugar, and beverage crops.

At present, farming within New England itself could fairly be called sustainable. Environmental issues, such as excess nutrients and sediments reaching waterways from confined livestock feeding operations (Conservation Law Foundation 2008), need to be addressed but are small in comparison to other regions of the country. This is partly because agriculture occupies such a limited part of the landscape but also because most of New England's small and medium-sized family farmers are devoted stewards of their land and because of this region's relatively strong environmental regulations.

Beyond New England, where most of our food is grown, large-scale agriculture accounts for well-documented environmental consequences. The concentration of manure in feedlots and confined hog and poultry feeding operations, increased rates of antibiotic-resistant illnesses, and excess applications of fertilizer and pesticides to extensive fields of vegetables and grain threaten human health, impair inland water quality, and contribute to large anoxic dead zones in the nation's coastal waters (CDC 2013a, Ernst 2009, Estabrook 2012, Halden and Schwab 2008, Hapeman et al. 2002, Pollan 2007, Rabelais et al. 2002, Roberts 2008, Schlosser 2012, Steinfeld et al. 2006). Emissions of greenhouse gases such as nitrous oxide, methane, and carbon dioxide from chemical- and energy-intensive forms of agriculture affect global climate (Bernie et al. 2010, Smith et al. 2008, Weiske et al. 2006). Increased water scarcity threatens prime farming regions from California's Central Valley to the Midwest, and global warming is likely to make the problem worse (Walthall et al. 2012). Fisheries likewise face great challenges, including overfishing, habitat degradation, nutrient pollution, acidification, warming waters, and introduction of invasive species and pathogens (Buchsbaum et al. 2005, Cheung et al. 2013).

The economic impacts of these environmental challenges, together with growing global demand for food, are expected to lead to rising food prices in the coming decades (Westcott and Trostle 2013). That stimulus alone may drive an increase in food production in New England, where a large population inhabits a landscape of abundant water and undercultivated land. But such an agricultural expansion could also make the region vulnerable to similar environmental concerns, especially if it means loss of invaluable forests that cleanse water and sequester carbon. "Local" agriculture is not intrinsically sustainable; it must be made so deliberately by strong incentives that reinforce the desire of conscientious farmers and fishermen to employ best practices. Similarly, there is no guarantee that local farming will lead automatically to healthier eating or to improved access to food for everyone. Indeed, if food prices rise, shortfalls in healthy food consumption could become more acute. Local food is not a panacea, but it may be an opportunity to gain greater control of our food system. Business as usual is neither sustainable nor desirable. New England needs a better future in which more food is sustainably produced and everybody benefits.

Figure 4. New England's Current Agricultural Footprint

Thousands of Acres*	NEW ENGLAND PASTURE	NEW ENGLAND CROPLAND	NON-NEW ENGLAND PASTURE	NON-NEW ENGLAND CROPLAND	TOTAL FARMLAND NEEDED
1 **Vegetables**		100		120	220
2 **Fruit**		80		250	330
3 **Grain, beans, and oil**		70		1,480	1,550
4 **Livestock**					
Pasture & harvested forage	450	950			1,400
Dairy†				1,220	1,220
Beef, sheep, goats†			3,180	4,140	7,320
Horses†				40	40
Swine				960	960
Layers				320	320
Broilers				950	950
Turkeys				230	230
Subtotal	*450*	*950*	*3,180*	*7,860*	*12,440*
5 **Other foods**					
Nuts				70	70
Sugar				410	410
Coffee, tea, chocolate				570	570
Wine				80	80
Subtotal				*1,130*	*1,130*
6 **Other agricultural products & cropland**		210			210
TOTALS	**450**	**1,410**	**3,180**	**10,840**	**15,880**

*rounded to the nearest 10,000 acres (totals may not sum correctly) †additional feed

NUMBER OF ANIMALS IN NEW ENGLAND

Dairy cows 200,000

Beef animals 200,000

Lambs 30,000

Pigs 44,000

Laying hens 6,800,000

Broilers 500,000

Turkeys 100,000

Producing food for the 14.5 million people who live in New England requires about 16 million acres—the region's agricultural footprint. The green bars show reported acres of cropland and pasture in New England, while the yellow bars represent estimated acres outside the region. New England currently has half the acreage required to produce its vegetables and a quarter of the acreage for its fruits. The data do not specify how New England's pasture and forage are used, but the dairy herd accounts for most of New England's livestock. These cows, which supply about half of New England's dairy consumption, must account for about 85% of the farmland within the region. New England produces only a small fraction of its beef, pork, and poultry—beef alone accounts for almost half of the total acreage (mostly outside New England) that is required to feed the region today. New England produces just 2.5% of its grain, vegetable oil, sugar, beverage crops, and other food. All in all, measuring by acreage, New England farmland supplies a little more than 10% of the food New Englanders eat.

	1,000 ACRES	PERCENT
New England total	1,860	12%
Non-New England total	14,020	88%
Total Footprint of New Englanders	**15,880**	**100%**

Per capita footprint of New Englanders **1.1 acres**

New England's Food Future

Local food is just a means to an end: it is useful only if it delivers real social and environmental benefits.

Core Values

A New England Food Vision calls for a dramatic increase in the region's food production. But heightened regional food production is just a means to an end: it is useful only if it delivers real social and environmental benefits. Therefore, this vision is guided by the following principles, which are also its aspirations.

- Access to adequate, healthy, culturally appropriate food at all times is a basic human right.
- In the coming half century, New Englanders will move toward healthier diets with adequate fresh vegetables, fruits, and whole grains as well as more diverse sources of protein.
- Increased food production will be environmentally sustainable, recycling nutrients and promoting healthy fish stocks and crop diversity, soil and water quality, energy conservation, carbon sequestration, and resilience in the face of changing climate. Farmland will be expanded and protected while allowing for economic development and effective conservation of forest and water resources across the region.
- Strong local and regional agriculture and sustainable coastal fisheries will help New England communities thrive by providing a decent livelihood to farmers and fishermen, by supporting a diverse range of economic activities extending well beyond farms and harbors, and by creating and maintaining attractive communities for people to live in and visit.

Healthy Food: A Fundamental Human Right

Producing more food within New England will do little to promote revitalized communities and food system equity unless the right to food is an explicit goal. The US government does not formally recognize the right to food, but all other industrialized countries do, and it is part of international agreements such as the United Nations Universal Declaration of Human Rights, which the United States has signed (Anderson 2013).

Food security—access by all people at all times to enough food for an active, healthy life—is worsening in New England, according to official estimates by the US Department of Agriculture (USDA) (Coleman-Jensen et al. 2013) (see Figure 5).

Today's food system does not feed everyone adequately. With rising rates of income inequality (Center on Budget and Policy Priorities 2013), persistent race inequality (Powell 2012), and wage stagnation (Economic Policy Institute 2012), more and more people cannot have their food needs met by a system that is accessible only to those with stable income and good health. Even today, with food plentiful and inexpensive, we see the paradox of overconsumption of low-nutrient empty calories in the midst of unprecedented food insecurity rates (Krebs-Smith et al. 2010). Without dramatic changes in policy to ensure that everyone has access to food, what will happen in a future where food is more expensive? Even if the percentage of the population that is lacking adequate food drops to prerecession levels, nearly 1.3 million New Englanders will still do without sufficient food (Coleman-Jensen et al. 2013, US Census Bureau 2010).

American citizens can apply for federal food assistance programs such as the Supplemental Nutrition Assistance Program (SNAP, formerly known as Food Stamps) and the National School Breakfast and Lunch Programs. Half of all children in the United States and about 90% of black children or those living in a single-parent household will participate in SNAP at some time during childhood (Rank and Hirschl 2009). Even with these programs, children are suffering disproportionately from food insecurity (Breen et al. 2011).

Inadequate funding for SNAP and other federal food programs often leads to less expensive but also less healthy purchases, and applying can be complicated and onerous. Many of the working poor earn wages that restrict participation. At best, the availability of federal food assistance falls short of need. To help compensate, a large network of private food assistance has been set up by churches, community organizations, and nongovernmental organizations (Block et al. 2012, Food Research and Action Center 2012, Anderson 2013). Since Congress cut funding to SNAP in early 2014, these organizations are anticipating an unprecedented rise in numbers of people needing their help.

The failures of national and private food assistance programs are felt at a personal level. New Englanders tend to value independence and self-reliance. In such a culture, the inability to provide for a household's food needs can be deeply shameful, and some may hide their hunger from public view (Connell et al. 2005).

Future changes in the global market may drive greater food production in New England, with some beneficial results. But without changes in policy, stepped-up production alone cannot ensure a future in which healthy food is accessible to all. Rising demand by those who can afford the best-quality food can only go so far to boost regional food production; deliberate efforts toward achieving a larger, shared vision of a better food system for everyone to enjoy are critical as well. Such a vision must center on healthy food for all as a basic human right.

Figure 5. Low and Very Low Food Security

	2000–2002	2007–2009	2010–2012
Connecticut	8%	11%	13%
Maine	9%	15%	15%
Massachusetts	6%	10%	11%
New Hampshire	7%	9%	10%
Rhode Island	10%	14%	15%
Vermont	9%	14%	13%

Shown as Percentage of Population

Over the past decade food insecurity has risen to encompass between 10 and 15% of New Englanders. Low food security means reports of reduced quality, variety, or desirability of diet. Very low food security means reports of disrupted eating patterns and reduced food intake.

The Omnivore's Delight — A Projected Future Regional Diet

The projected patterns of future food consumption in New England presented here broadly reflect nutritional guidelines suggested by the USDA's MyPlate (2014) and the Harvard School of Public Health's Healthy Eating Plate (2011, 2012). Estimated caloric intakes are based on the projected weight distribution of the population and include fewer refined carbohydrates, reduced (and healthier) fats, less red meat, current levels of dairy and egg consumption, more fish, more whole grains, and more fruits and vegetables than people consume today (see Figure 6). Total protein intake in this Omnivore's Delight is similar to current dietary patterns, but meat is reduced. Meat (especially grain-fed beef) is a resource-intensive protein source, and anticipated higher prices are likely to reduce access and consumption.

How many calories would the typical person need? The Institute of Medicine has calculated Estimated Energy Requirements (EER) based on gender, age, size, and level of physical activity (Institute of Medicine 2005). The average caloric need for the Omnivore's Delight diet is calculated at 2,300 calories, a figure derived from these EER formulas coupled with 2010 New England census population data (US Census Bureau 2013), and adjusted based on national childhood weight data (Ogden et al. 2012) and New England adult body weight estimates (CDC 2013b). It assumes physical activity that is "low active"—the equivalent of walking 1.5 to 3 miles per day. Other researchers have suggested a similar calorie level (Peters et al. 2007, Peters et al. 2009).

Likewise, average protein need in the Omnivore's Delight diet was calculated based on population distribution, current weight estimates, age, and gender. Though average females and males are often identified as needing 46 and 56 grams of protein (Institute of Medicine 2005), the Omnivore's Delight average of 60 grams includes increases based on weight distribution and rounding.

The Omnivore's Delight assumes that even if basic commodities such as grain are more expensive in 50 years, they will still be available on the global market. Tailored to crops that New England is best able to produce given our soils and climate, it contains plenty of diversity and allows for a wide range of cuisines. In the event future food prices rise dramatically and we face a world of greater scarcity, *A New England Food Vision* also examines a second, more plant-based Regional Reliance diet (Figure 6).

A New England Food Vision is not intended to impose any particular diet or to suggest that people should not enjoy a variety of foods to suit their tastes. The diets outlined here are based on average nutritional intake encompassing a broad range of ethnic food cultures and personal choices by many millions of people. They assume, for the purposes of calculation, that by 2060 most people will choose to eat in a healthy manner (according to their own taste) and that promoting access to high-quality local food can help encourage movement in that direction.

THE OMNIVORE'S DELIGHT DIET COMPARED TO MYPLATE

For a 2,300-calorie diet, the USDA's MyPlate recommends approximate daily intake of vegetables (3 cups); fruit (2 cups); grain (7.5 ounces); and dairy (3 cups) —with room left over for a small addition of oils, fat, alcohol, and sugar to fill out the calories. The Omnivore's Delight diet generally follows MyPlate guidelines, with three notable exceptions (discussed below): dairy, fish, and alcohol. For protein, the calculated average intake of 2.1 ounces was applied.

► ***Vegetables.*** Vegetables are nutrient-dense foods rich in vitamins, minerals, and fiber. The USDA recommends 3 cups of a colorful mix of leafy green, red and orange, and starchy vegetables—almost double current consumption.

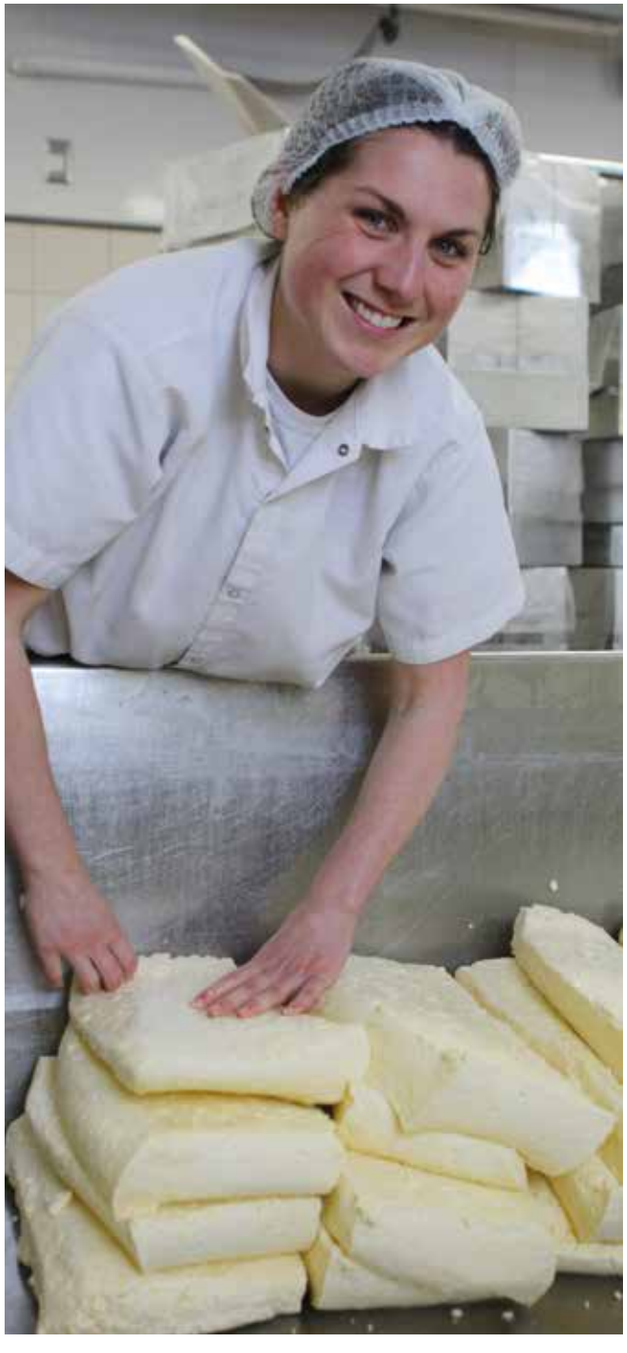
		SERVINGS	CALORIC INTAKE
1	**Vegetables (mix)**	1.6 cups	4%
2	**Fruit—cool climate**	0.4 cup	1%
3	**Fruit—warm climate**	0.3 cup	1%
4	**Whole grains**	0.7 oz	3%
5	**Refined grains**	6.9 oz	18%
6	**Protein-rich plants**	0.6 oz	3%
7	**Meat, fish, eggs**	7.1 oz	23%
8	**Dairy**	1.5 cups-eq	10%
9	**Added fats**	2.2 oz	19%
10	**Discretionary calories** *added sugar, alcohol, misc*	500 cal	18%

		SERVINGS	CALORIC INTAKE
1	**Vegetables (mix)**	3 cups	7%
2	**Fruit—cool climate**	1 cup	4%
3	**Fruit—warm climate**	1 cup	5%
4	**Whole grains**	3.75 oz	11%
5	**Refined grains**	3.75 oz	15%
6	**Protein-rich plants**	1.6 oz	7%
7	**Meat, fish, eggs**	5.2 oz	15%
8	**Dairy**	1.5 cups-eq	9%
9	**Added fats**	1.1 oz	12%
10	**Discretionary calories** *added sugar, alcohol, misc*	350 cal	15%

		SERVINGS	CALORIC INTAKE
1	**Vegetables (mix)**	3 cups	7%
2	**Fruit—cool climate**	2 cups	8%
3	**Fruit—warm climate**	0 cups	0%
4	**Whole grains**	3.75 oz	11%
5	**Refined grains**	3.75 oz	15%
6	**Protein-rich plants**	2.6 oz	11%
7	**Meat, fish, eggs**	3.3 oz	9%
8	**Dairy**	1.5 cups-eq	9%
9	**Added fats**	1.4 oz	15%
10	**Discretionary calories** *added sugar, alcohol, misc*	335 cal	15%

Figure 6. Comparing Diet Patterns

The Current Diet table is based on food availability and loss data. It estimates the number of daily servings per person for food and beverage categories such as vegetables and fruits. amounting to 2,830 calories. The Omnivore's Delight pattern is informed by USDA MyPlate guidelines for a person consuming 2,300 calories, except that dairy consumption is lower, as recommended by Harvard's Healthy Eating Plate. The Regional Reliance pattern also follows USDA guidelines but with more plant-based proteins, and regional fruit completely replaces imported fruit. The pie charts of each pattern depict the percentage of calories provided by the various food categories, and highlight the dramatic increase in nutrient-dense vegetables, fruits, whole grains, and protein-rich beans in the Omnivore's Delight and Regional Reliance diets alongside the corresponding decrease (but not disappearance) of meat, added fats, and discretionary calories.



► ***Fruit.*** Fruits are sources of essential nutrients such as potassium, vitamin C, folic acid, and fiber. MyPlate recommends more than doubling current daily fruit consumption to 2 cups.

► ***Legumes and Nuts.*** Dry beans and peas are healthy, versatile foods that function as both vegetables and low-fat, fiber-rich protein sources. The Omnivore's Delight diet suggests more than twice the bean consumption that is typical today. Nuts are also healthy sources of protein and fats (Rebello et al. 2014).

► ***Grain.*** The quantity of grain in the average American diet in bread, snacks, pizza, pasta, breakfast cereals is close to MyPlate recommendations. Unfortunately, most of these carbohydrates are highly refined and processed. In the Omnivore's Delight diet, whole grains such as whole wheat flour, oats, and brown rice are half of the grains eaten—triple the current intake (USDA 2013b).

► ***Dairy.*** Milk provides protein, calcium, vitamins, and fats. The USDA recommends daily consumption of 3 cups per day, a level many nutritionists consider too high (Harvard School of Public Health 2011, Nestle 2006, Peters et al. 2003). Harvard Healthy Plate recommends 1 to 2 cups daily. Omnivore's Delight keeps consumption at the current 1.5 cups equivalent. Individuals may need to consume more dairy products fortified with vitamin D or take calcium supplements.

► ***Meat and Eggs.*** Meat and eggs are good protein sources. Overall, Americans eat more red meat than considered healthy or necessary. MyPlate stresses choosing lean cuts of meat, while Harvard Healthy Plate recommends limiting red meat to 6 ounces per week. Omnivore's Delight reduces average beef intake by two-thirds and pork consumption by half from today. More lamb and kid are eaten than currently, but they remain a small portion of the diet. Beef and lamb in the Omnivore's Delight are raised on pasture, making them higher in healthy omega-3 fatty acids than grain-fed meats.

Chickens and other fowl, which convert grain more efficiently than beef and provide relatively healthy meat, dominate the animal protein portion of the Omnivore's Delight diet. Poultry and egg consumption in the Omnivore's Delight is unchanged from today.

► ***Seafood.*** The USDA recommends average consumption of 9.5 ounces of fish a week for a 2,300-calorie diet, triple the current levels. Many fish provide healthy elements, including rich omega-3 fatty acids, but some also contain heavy metals and toxins, so moderation is key (Mozaffarian and Rimm 2006). Even with all depleted stocks recovered, it would be difficult for New England waters to produce enough fish for the region's residents at the level the USDA recommends. The Omnivore's Delight diet includes 4 ounces a week, still higher than the current 3-ounce intakes.

► ***Animal Fats and Vegetable Oil.*** MyPlate and Harvard Healthy Plate recommend only low-fat milk and cheese and place limitations on butter. In the Omnivore's Delight, New England cows feed mostly on pasture and hay. Grass-fed dairy fat may contain higher levels of omega-3 fatty acids or a better fatty-acid profile, making such fat a more appropriate part of a healthy diet (Clancy 2006, Croissant et al. 2007, Ellis et al. 2007, Slots et al. 2009, Benbrook et al. 2013). This diet retains all the butter and cheese that New England's cows produce as important regional sources of fat and makes up the rest with vegetable oils. Given a reduction in other sources, the Omnivore's Delight meets the suggested daily limit of less than 300 milligrams of cholesterol and less than 10% of calories from saturated fats.

Some Americans get enough oils in the foods they eat, thus the need for added oil varies. Using MyPlate guidelines, the daily allowance equals 5–6 teaspoons of oil per day. In the Omnivore's Delight, New England butter reduces this by about 15%. Canola and olive oils make up the rest.

► ***Sugar.*** Sugar and other sweeteners in the Omnivore's Delight are reduced by two-thirds but certainly not eliminated. A daily teaspoon of honey is included and New England's signature sweetener, maple syrup, is left at current levels.

► ***Alcohol.*** For those who drink alcohol, the USDA suggests limiting consumption to no more than one drink a day for women, two for men. For nondrinkers, the calories can be replaced by fats, sugars, or healthier foods.

► ***Sodium.*** Given minimal reliance on highly processed and savory snack foods in the Omnivore's Delight, anticipated intakes of sodium could be one-third to half current levels.

Food Production for the Omnivore's Delight

ESTIMATING PRODUCTION

A New England Food Vision projects that half a century from now New England could produce half of the food its residents need, assuming a diverse Omnivore's Delight diet as just described. This projection is the result of detailed calculations involving: (1) the amounts of the different foods making up the diet that the region's population would consume, (2) the amount of potentially available farmland in New England, (3) the yields of various foods that farmland could produce, and (4) the portion of the total food need that could therefore be met through regional production.

The pages that follow summarize foods that could contribute to the New England diet and examine the land base needed to serve regional needs, with the aim of optimizing local and regional food production for the greatest environmental and social benefits. In the event the future brings greater food scarcity, a second Regional Reliance scenario is presented in which more farmland is cleared and New England is able to produce about two-thirds of its food.

Tables and spreadsheets presenting all of the data and calculations are available online (http://foodsolutionsne.org/new-england-food-vision). Readers can view the numbers, alter choices and assumptions, and consider for themselves what other future New England food systems might look like.

NEW ENGLAND'S POPULATION IN 2060

New England's population today is about 14.5 million. It is growing slowly—the Census Bureau projects it will reach 15 to 16 million by 2030 (US Census Bureau 2005). If this rate continues, at midcentury there might be 17 million New Englanders, distributed across the region roughly as at present. *A New England Food Vision* assumes that most will continue to live in existing cities and suburbs—although in greener versions of these places that are producing more of their own food.

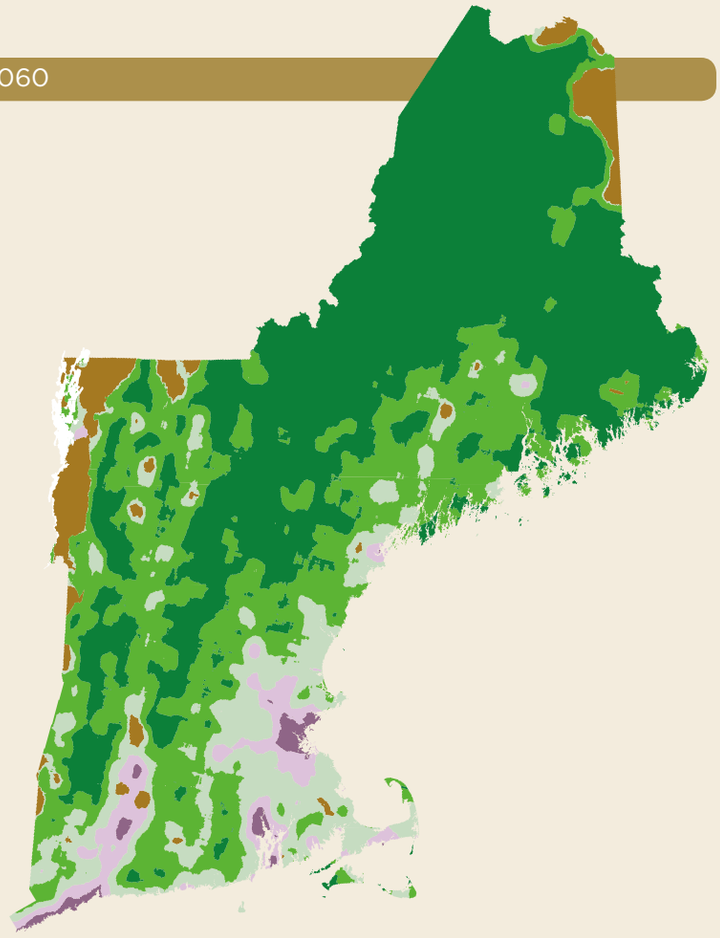
While New England's demographic growth is projected to be relatively modest, the population of the United States, and of the globe, will continue to expand more rapidly. Environmental and social pressures within our nation (particularly in the dry Southwest) could induce many people to move toward the Northeast. If that happens, the challenges of regional food reliance will be greater. *A New England Food Vision* assumes that whatever their total numbers, new waves of immigrants will continue to add ethnic diversity to the region—and its food—as they have in the past.

FUTURE FARMLAND IN NEW ENGLAND

Any sustainable vision for the future of New England farming and fishing must begin with vigorous protection of New England's recovered forest. Forests provide social and ecological benefits, including temperature modulation, carbon storage, recreation, and wildlife habitat. Managed forests (including farm woodlots) produce timber, fuel, pulpwood, shavings for livestock bedding and compost, nuts, and maple syrup—indeed, farms and forests are intimately connected across much of the landscape. Most important, forests protect water, maintaining both quantity and quality. These functions are crucial for public and private water supplies, for healthy streams and lakes, and for coastal and marine ecosystems. If additional land is to be cleared to increase food production, the resulting loss of forest needs to be carefully weighed. Every landowner needs to consider the nature of each site and to have access to help evaluating its suitability for retention as forest or conversion to farmland.

New England is currently about 80% forested. Only about 5% of the region (less than 2 million acres) is presently producing food. *A New England Food Vision* calculates the potential for food production if agricultural land cover were to rise to 6 million acres, or 15% of the landscape, approaching 1945 levels. New farmland would consist largely of pastures and fields that have been abandoned since World War II and are now covered by

Figure 7. New England Farmland 2060



Farmland, developed land, and forest are found in a range of mixtures across the landscape. The landscape types and percentages shown here are broad estimates, but taken together they reflect over 70% of the land in forest, some increase in "smart" development, and 6 million acres of farmland. Several hundred thousand acres of intensively cultivated land can be found in small pieces within cities and suburbs. In semirural areas there is room for more fruit and livestock production as well. The woods and pasture part of the landscape, along with places within the heavily forested area, provide scope for several million acres of dairy and beef production. Parts of New England that have remained devoted to agriculture, such as Aroostook County, the Champlain Valley, and the Connecticut Valley, become even more highly cultivated.

LANDSCAPE TYPE	ACRES FARMLAND	PERCENT FARMLAND	PERCENT DEVELOPED	PERCENT FOREST
Urban	20,000	5	85	10
Suburban	210,000	15	60	25
Semi-rural	1,300,000	25	25	50
Highly Cultivated	1,170,000	60	10	30
Woods & Pastures	2,120,000	17	8	75
Forest	1,240,000	6	4	90
TOTAL	**6,050,000**	**15**	**11**	**74**

young forests. Some of this land is good-quality cropland; much of it (given the nature of New England) is hard to plow but excellent for orchards and pastures. That is why this vision focuses on vegetables on the best cropland, with fruits, grass, and livestock on the rest (Figure 7).

Such a tripling of farmland is compatible with—and was anticipated by—the ambitious vision presented by Harvard Forest and other New England scholars in 2010: the Wildlands and Woodlands goal of retaining 70% of the region in permanent, mostly sustainably managed forest (Foster et al. 2010). Keeping forest at 70% overall entails forest cover of at least 50% in southern New England and at least 80% in northern New England.

At the same time, developed land could rise from its present 10% to cover as much as 12% of the region, with more in the southern and coastal areas and less in northern and western parts. Accomplishing this would require keeping additional development compact. Both the successful protection of intact blocks of forest to maintain ecosystem functions and the recovery of farmland will therefore depend on "smart growth" (Benfield et al. 2001, Governors' Institute on Community Design 2010).

Smart growth may include more effective siting of new housing and other developments in cities and towns, clustering buildings and reducing lot sizes to provide for greater acreages of open space, and creatively reusing existing structures and infrastructure. If in the process as little as 5–15% of urban and suburban land can be reclaimed for private gardens, small-scale community and commercial farms, and permaculture, that would provide several hundred thousand acres of land for intensive food production right where it is most needed.

There is ample room to expand New England agriculture without decimating the region's recovered forests and without derailing necessary economic development. Of course, in the face of more pressing need, future generations could clear still more farmland, but they would lose beneficial forest ecosystem services, and each additional acre would be increasingly marginal for farming. *A New England Food Vision* strikes a balance in which a small reduction in the region's expansive forest can be converted to a large expansion of its most suitable farmland.

FOODS MOST FEASIBLE FOR NEW ENGLAND TO PRODUCE

What could New England produce on 6 million acres of farmland, to help feed 17 million people living here by the middle of this century? For every kind of food that *could* be produced in New England, this section examines the acreage that would be required to feed such a population (assuming healthy diets) and considers how much of that food it *makes sense* to produce here, given limited farmland. The analysis focuses on crops that are particularly well suited to New England and looks at integration of these foods into coherent, sustainable agricultural systems.

The production categories considered are vegetables, fruits, beverages, grains, animal products (dairy, eggs, and meat), vegetable oils, sugar, fish, and foraged foods.

Omnivore's Delight includes both foods that can best be produced locally (such as green vegetables) and those that are often best grown, processed, and distributed regionally (such as dairy products). Following Ruhf and Clancy's *It Takes a Region*, local foods are defined here as those that are grown within 100 miles of where they are eaten and that often move directly from producers to consumers; regional foods are those that can help meet a set of social and environmental goals by being grown within a given region but that travel through longer processing and supply chains (Ruhf and Clancy 2010).

At the same time, there are foods that can sensibly be purchased from national and global markets rather than growing them here. Given the region's population and production limitations, it is unlikely that New England will ever be completely self-sufficient, but the region can do surprisingly well at feeding itself.

The pages that follow illustrate how New England might produce up to half the food for the Omnivore's Delight diet. As with the Business as Usual summary in Figure 4, production is expressed as an acreage footprint, the number of acres required to produce the amounts of different foods needed to feed New England in 2060 (see Figures 8 and 9).

DETAILS OF SUSTAINABLE PRODUCTION

Estimates of 2060 production potential for the major categories of foods identified in the Omnivore's Delight diet follow.

► ***Vegetables.*** In 2060, New England grows almost all of its vegetables. Local vegetables provide variety, flavor, and health advantages; are eminently suitable as New England crops; and are readily preserved. Producing more of New England's vegetables within the region presents two key challenges: growing this produce as locally as possible and covering all the seasons.

About 500,000 acres are devoted to vegetable production—a fivefold expansion from 2010. Up to half the produce is grown locally on small parcels in cities and suburbs, close to where people live: in home, school, and community gardens; community farms; CSAs; and the like. Local production improves freshness and quality and allows many people to participate in growing their own food. Gardening can lower food costs; foster connections that lead to learning how to cook and to healthier eating; and make use of composting programs that efficiently recycle food, yard, and municipal waste in urban and suburban settings.

The other half is grown regionally on rural farms, including larger CSAs; in farm stand operations; and by growers who sell through farmers' markets, food co-ops, institutional contracts, and supermarkets. Field crops such as sweet corn, brassicas, potatoes, carrots, and winter squash can be grown in rotation with hay and intensive pasture on diversified farms that also raise livestock. This high-value production provides a welcome boost to New England's rural economy.

Two strategies contribute to assure a year-round supply of vegetables. First, extending the season with greenhouses, hoophouses, and cold frames is most energy-efficient in winter for hardy greens such as spinach, chard, kale, Asian greens, and some lettuces, making a winter salad mix. It can also expand the fall

and spring shoulders of some warm-season crops. Second, we can eat fresh produce in season, relying more on stored crops (such as squash, carrots, beets, potatoes, cabbage, and onions) in winter and preserving the summer harvest by freezing, canning, drying, and processing into soups, sauces, chutneys, pickles, and sauerkrauts. Processing can be done at home gardens and kitchens, on the farm, and at a larger community and commercial scale.

The demand for imported fresh produce in the off-season may never fully disappear, but the great bulk can be grown in New England. The processing and distribution infrastructure will need to expand to take full advantage of what can be grown.

► ***Dry Beans and Peas.*** About half the dry legumes to meet the increased demand of the Omnivore's Delight are grown in New England. Beans require a lot of acreage—some 300,000 acres for this diet. They are cultivated more like a grain than a vegetable and can be grown in rotation with hay and grains. Beans are also good candidates to be brought from afar, as they come in small, nutrient-dense, durable packages.

► ***Fruit.*** For New England to produce all of the fruit it consumes would require about a million acres. It would also mean giving up oranges and bananas, something most people would not gladly do. Accordingly, in Omnivore's Delight, cool-climate fruit production is expanded in New England, while warm-climate fruits are still imported. About half of the fruit New Englanders consume is grown within the region, an enormous increase.

Apples and tree fruits. Apples and other tree fruits will make up the bulk of any large-scale revival of New England fruit production. The Omnivore's Delight projects about 275,000 acres—beyond the greatest extent of orchards in the region's history. Fruit production in New England has been declining for a century in the face of competition from California, Washington, and beyond (Huang 2013), but higher energy costs and water scarcity may return the advantage to this part of the world. New England soils are excellent for tree fruit. The climate is favorable, except that abundant humidity and rainfall mean extra trouble from scab and other pests, raising production costs.

Grapes, Berries, and Melons. Omnivore's Delight projects 160,000 acres of grapes, berries, and melons in New England in 2060. The region domesticated the Concord grape, but only about 1,000 acres of grapes are grown here today. High-bush blueberries, strawberries, raspberries, blackberries, and melons add another 4,000 acres. There is great scope for expansion, especially for grapes, which are high yielding and for which varieties well suited to New England now exist.

Wild Blueberries. As is the case today, in the Omnivore's Delight "wild" low-bush blueberries, high in antioxidants and vitamins, cover about 47,000 acres of New England, mostly in Maine. These blueberries may be wild in origin, but they are cultivated: the barrens where the berries grow are typically burned or mowed every other year to renew their growth, and weeds and pests are controlled. Most of the crop goes for processing and juice. Wild blueberries were once harvested widely across New England, so there is room for expansion, but the yield is low compared to apples, grapes, or cranberries. Many more thousands of acres would be needed to make a significant impact on regional production.

Cranberries. In *A New England Food Vision*, cranberries occupy about 14,000 New England acres, mostly in southeastern Massachusetts, as today. The industry has done reasonably well in recent years, after a period of oversupply and increased competition from Wisconsin and elsewhere (Cape Cod Cranberry Growers Association

2014). Massachusetts now produces about one-quarter of the US cranberry crop, much of which is exported to other states (USDA 2013c). Most is wet harvested for juice and processing. Future demand may rise, but cranberries require specialized sandy bog sites with surrounding woodlands to supply water. This landscape is under severe development pressure in southern New England. Climate warming may also rob cranberries of their needed winter cold dormant period. How effectively production can be increased farther north in New England is not known.

Fruit Juices. Cider and juice are important parts of increased fruit production. Conversion of fruits to beverages has been part of New England agriculture since its beginnings. As a practical matter, making juice and cider goes hand in hand with growing higher-value table fruit: juice can utilize cull fruit or allow efficient bulk harvesting of much of the crop.

► ***Grain for Human Consumption.*** Grain production in *A New England Food Vision* is limited to acreage available once higher priorities for scarce cropland have been met. Grain fits well within crop rotations and feeding regimes on many farms and may find a strong niche market, but compared to vegetables and fruits there is less nutritional or environmental advantage to growing grain locally.

Wheat makes up more than two-thirds of the grain Americans directly consume today (excluding corn syrup and beer), followed by corn, rice, and much smaller amounts of oats and barley. Several hundred thousand acres of New England cropland could be divided in many ways among wheat for specialty products such as artisanal bread and for home baking, barley for craft-brewed beer, corn, and oats. This would still represent only a small portion of the grain New Englanders consume.

New England's moist climate is not ideal for wheat. On the other hand, small grains can succeed in some years, and crops not acceptable for human consumption can be fed to livestock. Producing even one-tenth of New England's wheat supply would mean nearly a 100-fold increase over what is grown today. If some foods need to be brought from elsewhere, there is much to be said for looking to the Midwest for grain (Wilkins and Gussow 1997).

► ***Livestock.*** Most of the new farm acreage in *A New England Food Vision* is devoted to grass-fed livestock. Dairy farming remains a cornerstone of New England agriculture. Meats, including beef, lamb, pork, and poultry, continue to be part of the regional diet. Ruminants can convert grass to protein from the pastures that are suited to many New England soils. Pasture-raised livestock produce milk, meat, and eggs that provide a healthier profile of fatty acids (Clancy 2006, Croissant et al. 2007, Benbrook et al. 2013, Bee 2004, Popova 2007, Campo et al. 2013).

Of the 6 million acres of farmland in this vision, some 2 million are suitable only for pasture and orchard and another million are probably best suited for pasture and hay. The Omnivore's Delight allocates 3 million acres to pasture and another 1.5 million to hay. Intensively managed pastures are an enormous unrealized agricultural resource, a place where New England's soils and climate can show a real competitive advantage.

New England's glacial till soils are often too steep and stony for row crops, but they are rich in minerals and well suited for grass. To reach high productivity they require regular lime and return of nutrients, but most of all they must be carefully managed with rotational grazing that elevates the yield and quality of their grasses and legumes. A sustainable regime for New England can involve a combination of intensively managed grazing on the best pastureland, together with some late grazing and haying of rougher land, as demonstrated at Appleton Farm in Massachusetts. A lighter grazing regime accommodates dry cows and beef cows and at the same time provides habitat for open-land wildlife.

Dairy. Increased dairy production is fundamental to *A New England Food Vision*, with the largest acreage, economic, and environmental footprints of all crops. Dairy farming is New England's most important agricultural industry and is at the heart of its pastoral landscape.

This vision projects regional self-sufficiency in dairy production by 2060—but only by taking advantage of abundant pastures. Today the region produces about half of its dairy needs (American Farmland Trust 2012). In Omnivore's Delight, two-thirds of the milk is separated to produce low-fat milk, butter, and ice cream; the rest goes to make cheese and yogurt.

Milk cannot easily be produced entirely on pasture and hay (or haylage); a significant grain supplement is needed to ensure steady milk flow. A range of production models will evolve as farmers decide what works best for them, given economic and environmental realities. However, in a future of rising fuel and feed costs and rising consumer demand for grass-based dairy (and meat), along with growing expertise in pasture management and grass feeding, pastures can move back to the center of New England dairy farming. Because a large part of the acreage that can be recovered from forest is suited less to row crops than to hay and pasture, increased grass-based dairy farming will help optimize what New England can produce from its own soil.

Providing dairy products for 17 million New Englanders requires an estimated 600,000 milking cows, roughly doubling present dairy production. This translates to a herd of about 700,000, including dry cows. Calculations are based on Jerseys, a small breed well adapted to grazing and with milk rich in butterfat, although the future dairy herd is likely to include a wide variety of breeds.

Presuming feed based on high-quality pasture, hay, and a small (8 pounds per day) grain supplement, a conservative yield of 14,000 pounds of milk per cow per year is projected. At 2 acres of pasture plus 1 acre of hay per cow, and accounting for heifers and calves, this requires some 1.8 million acres of pasture with another 900,000 acres of hay. Feed grain is brought in from outside New England. Such a vigorous re-expansion of dairy farming will transform rural New England, put a strong agricultural pulse back at the heart of the economy, revitalize communities, and revive the pastoral landscape. Although it might feature a range of feeding regimes, a renaissance of this scale is hard to imagine unless the region makes the most of what its soils and climate have to offer: its pastures.

Beef. While Omnivore's Delight substantially reduces consumption of red meat, it sharply increases New England red meat production, by an approach that is closely tied to the region's landscape and designed to improve environmental and human health.

Most of the beef comes as a by-product of the dairy revival. The longer milk cows are kept in production, the more of the herd can be cross-bred for high-quality beef. Some beef comes from the culled cows, most of which become hamburger. Some comes from bull calves born to cows bred to dairy sires (about half the 700,000 cow herd). The other half of the dairy herd is crossbred for high-quality beef. These calves are grown entirely on grass for 20-24 months.

Most of the 1 million acres of remaining pasture is grazed by about 200,000 beef cows and the steers and heifers they produce. Additionally, 500,000 acres of cropland grow hay for beef animals. A small amount of supplemental grain is imported for the lactating beef cows.

Sheep and Goats. Sheep and goats provide meat (lamb and kid), milk (used largely to make specialty cheeses), and fiber. Both use pasture efficiently and can be substituted for or integrated with other livestock. If pastured with cattle, they may require less acreage because they graze somewhat differently than cows. Goats do well on rougher pasture. The ratio of beef cattle to sheep and goats can be shifted in either direction without greatly changing the bottom line.

Figure 8. Omnivore's Delight Agricultural Footprint

Thousands of Acres*		NEW ENGLAND PASTURE	NEW ENGLAND CROPLAND	NON-NEW ENGLAND CROPLAND	TOTAL FARMLAND NEEDED
1	**Vegetables**		530		530
2	**Fruit**		500	330	830
3	**Grain, beans, and oil**		360	1,570	1,930
4	**Livestock**				
	Dairy	1,790	890	290	2,970
	Beef, sheep, goats	1,210	600	20	1,830
	Horses		80	40	120
	Swine			460	460
	Layers			320	320
	Broilers			1,150	1,150
	Turkeys			240	240
	Subtotal	*3,000*	*1,570*	*2,500*	*7,070*
5	**Other foods**				
	Nuts			110	110
	Sugar			80	80
	Coffee, tea, chocolate			670	670
	Wine			80	80
	Subtotal			*930*	*930*
6	**Other agricultural products**		30		30
	TOTALS	**3,000**	**3,000**	**5,330**	**11,330**

*rounded to the nearest 10,000 acres (totals may not sum correctly)

NUMBER OF ANIMALS IN NEW ENGLAND

Dairy cows 700,000

Beef animals 700,000

Lambs 1,200,000

Pigs 2,600,000

Laying hens 18,400,000

Broilers 331,500,000

Turkeys 17,200,000

This agricultural footprint represents the total acreage needed to provide a healthy Omnivore's Delight diet to 17 million people in 2060. It compares food grown in New England (green bars) with food grown elsewhere (yellow bars). All of the vegetables and about half of the fruits are grown within the region, while citrus and bananas are imported. That leaves enough cropland in New England to grow some of the grain, beans, and vegetable oil people consume, but most would need to be grown elsewhere. New England's pastures are devoted to providing all of the region's dairy products and as much beef and lamb as possible; in addition, about half the region's cropland is needed to provide hay and silage. The other livestock can be raised in New England, but the acreage footprint for their feed grain falls on cropland outside the region. Another million outside acres for imports such as sugar and coffee are needed to complete the Omnivore's Delight, while a small amount of land in New England continues to be devoted to nursery and floriculture production. New England produces just over half of what it eats by focusing on foods that can most advantageously be grown within the region.

	1,000 ACRES	PERCENT
New England total	6,000	53%
Non-New England total	5,330	47%
Total Footprint of New Englanders	**11,330**	**100%**

Per capita footprint of New Englanders **0.67 acres**

A New England Food Vision provides 1 acre of pasture to every five ewes (along with 7.5 lambs) and half an acre of hay per five ewes for the winter, plus supplemental grain for a few months before and after lambing. In all, sheep and goats account for about 200,000 acres of pasture and 100,000 acres of hay, plus 8,000 acres of imported grain.

Pastured Pork. All the pork needed for the Omnivore's Delight is raised within the region, widely dispersed in small and medium-scale operations. Given limited cropland, the bulk of pig feed must be grown elsewhere. Advantages to raising pigs in New England include the boost to the regional farm economy, the improved health and flavor of the pigs that come from their foraging, and the integration of manure into pasture farms at an environmentally sustainable scale.

Omnivore's Delight requires 2.6 million pigs from 160,000 breeding sows every year. This amounts to a 60-fold increase in pork production within the region. Many of these pigs will spend time on rough pasture or even wood pasture, which is especially good for finishing pork in heavy acorn years. However, most of the feed still comes from grain. Therefore, growers must either devote a substantial acreage to growing feed or buy it in (from about 450,000 acres beyond the region) and consider it part of the fertilizer regime.

Pastured Poultry. For Omnivore's Delight, in 2060 all of New England's poultry products are raised within the region in widely dispersed flocks. Lately, there has been great interest in the improved flavor and health of pastured poultry and heritage breeds. Benefits of raising chickens on a small scale in suburban areas and integrating them on a medium scale into farm pasture operations include the quality of the products, lower environmental impacts of production, and effective integration of an outside source of nutrients. In spite of picking up some supplemental feed by foraging, these flocks still require large grain imports.

Feeding New England requires about 330 million broilers a year. Some can be raised in movable pens on pasture and can be integrated with other livestock. In this way, they can be a significant fertility source for integrated grazing operations. However, at most only 10–20% of the sustenance of free-range poultry comes from grass and insects. Their feed grain requires well over 1 million acres of corn and soybeans from farmland elsewhere.

It takes some 18 million hens to supply eggs for New England in 2060. That is about four times the current population of hens and marks a radically different scale of production. These can largely be accommodated in backyard, farmyard, and "egg mobile" flocks that follow other livestock on pasture. Because the hens actually consume very little grass, they are essentially free riders on pasture that has served other stock in front of them in the rotation. Their health and the flavor of their eggs are much improved by a diversified outdoor diet, but the amount of grain required to feed them decreases very little, requiring about 300,000 acres of cropland, all or most of it outside New England.

Turkeys can get more of their feed from grass, and can be grazed effectively in orchards and vineyards. Still, they require over 200,000 acres of grain. Taken together, producing all of New England's poultry in the Omnivore's Delight requires 1.7 million acres of grain imports.

► ***Vegetable Oils and Sugar.*** Canola, sunflower, and soy oil can be produced in New England, but no regional production of vegetable oil is projected, assuming other crops have higher priority for the limited cropland. Some oilseed production could well substitute for grain or beans without changing the bottom line for New England food production. Oil imports account for 100,000 acres outside of New England.

New England has a cherished maple sugar and syrup tradition. Good woodlot management and tree planting might make it possible to boost maple production, but warming climate is likely to alter the reproductive success of maples and the length of the spring sap run across much of the region. The long-term prospects of increasing maple production are in serious doubt.

If honeybee colonies can recover from the catastrophic collapses that are affecting many hives,

regional honey production might well be increased. Much pollination of cranberries, blueberries, and apples, now done by long-distant migratory bee operations, might be done more sustainably by local hives and native pollinators (USDA 2009b). Even so, in the Omnivore's Delight maple trees and honeybees, while important to the agricultural economy, provide only 15% of the region's sugar. Imported cane and beet sugars supply the rest.

► ***Alcohol.*** Wine, beer, hard cider, mead, gin, brandy, vermouth, whiskey, and vodka are all currently produced by New England farms. Expansion of these activities could provide a significant economic boost to New England agriculture. Recent decades have seen the rise of craft brewing and brew pubs across the region. This trend in local beer could go farther if it were tied to production of barley and hops. Meeting New England's demand would require almost 300,000 acres of barley; Omnivore's Delight allocates 60,000 acres in New England

The region is seeing a revival in hard cider, which has about the same caloric and alcohol content as beer. Cider will become a nice value-added product for New England orchards, as will spirits such as apple brandy. Several successful fruit wineries, making a range from sweet peach and plum wines to dry apple and blueberry wines, have also emerged. Making such beverages is subsumed under the large increases in fruit acreage already described. Successful vinifera grape cultivation and winemaking has reached New England in recent years, primarily in the extreme southeast of the region, although cold-hardy hybrids are being tried even into Vermont and Maine. This vision does not speculate about how much acreage might be devoted to wine in 2060. Meeting regional wine demand at current rates of consumption requires about 75,000 acres.

► ***Foraged Foods.*** Deer, moose, game birds, mushrooms, blueberries, ramps, fiddleheads, seaweed, and other foraged foods add local flavor to the diet. The New England deer herd today is about 600,000, with an annual harvest of about 75,000 (Connecticut Dept. of Energy and Environmental Protection 2012; Maine Dept. of Inland Fisheries and Wildlife 2011, 2012, 2013a, 2013b; Massachusetts Dept. of Fish and Game

2014a, 2014b; New Hampshire Fish and Game Dept. 2013a, 2013b; Vermont Fish and Wildlife Dept. 2004, 2012, 2014; Rhode Island Dept. of Environmental Management 2013). Controlling and reducing this herd is critical to sustainable farming and forestry. However, even an increased deer harvest would amount to just a few percentage points in the region's meat supply—not significant overall but an important protein source in rural areas (Williams et al. 2013).

► ***Imported Foods.*** Omnivore's Delight has New England producing about half of its food, as measured by acreage footprint. The rest would have to be brought from elsewhere. These foods include:

- Citrus, banana, pineapple, and other warm-climate fruits
- About half the dry beans
- Most grains for human consumption and virtually all feed grains
- Vegetable oil, including soy, canola, and olive oil
- Peanuts and other nuts
- Avocados
- Coffee, tea, and chocolate
- Most wine, beer, and spirits
- Spices

Many of these foods are deeply embedded in American food culture, and future New Englanders will probably want to have them available. Acquiring some of the food supply from national and global markets provides a good balance with local and regional production for long-term food security. Each has its fluctuations in supply and price, and each has vulnerabilities.

Ideally, the prices New England consumers pay for imported foods will reflect the environmental and social costs of production. Sustainable farming in New England should connect with sustainable, just food systems everywhere.

Sustainable Seafood

Fish and shellfish have been part of the New England diet and culture since before European settlement. The fisheries of the Gulf of Maine, Cape Cod, Long Island Sound, and Georges Bank have a long history of providing food for New Englanders and livelihoods for those who work these waters. They have the potential to produce a great abundance of seafood for the region.

WILD-CAUGHT FISH AND SHELLFISH

Currently, New England waters produce approximately 2.5 ounces per week of seafood for each person in the region (about five-sixths of the amount consumed). This value is based on an annual average of National Marine Fisheries Service (NMFS) commercial landings data from 2001–2010 (excluding bait), less postharvest loss and processing loss (shells, cartilage, bones, etc.) and cooking and consumer waste (NMFS 2014). Reported landings do not include bycatch and reflect only what is brought back to shore, nor do they ensure that the harvest is at a sustainable ongoing level.

The potential productivity of New England's fishery is more difficult to calculate than potential farm production. Dispersed and inconsistent aquaculture data available from each state was not included in this analysis, although reported figures indicate that aquaculture presently accounts for less than 3% of seafood production in the region. Given projected population growth, 2.7 ounces per person per week may be attainable by 2060 if all currently depleted stocks are recovered (see website for calculations). As the Omnivore's Delight and Regional Reliance diets include 4 ounces per week, the remaining third of the seafood consumed may need to be imported. New England production numbers could go up if unintended bycatch is used as food and food waste is reduced or if aquaculture is expanded.

Challenges to the commercial fishery are many. They include overfishing of depleted fish stocks, red tide (which is exacerbated by warming water, high nutrient concentrations in seawater, and high streamflows after summer storms), closure of shellfish beds due to bacterial pollution from runoff, adverse effects of ecological alterations of ocean food webs on target species, and climate change (Moore et al. 1997). The seasonal nature of the fishery provides particular challenges, as do year-to-year variations in fish and shellfish populations due to both natural environmental variations and human activities. Because of permit and gear limitations, much of the catch is thrown away at sea, usually with high mortality and waste in the unused fish. Costs of boats, gear, fuel, crews, and permits as well as uncertainties about regulatory catch limits make it hard to plan and to assure an adequate return on the difficult and dangerous work of fishing.

AQUACULTURE

Aquaculture is playing an increasingly important economic role in the region, but there are many challenges in this realm as well. In a future with higher energy costs, land-based aquaculture systems may need to develop the ability to use alternative energy sources. Another sustainability challenge is the feed mix used for finfish aquaculture: it can take several pounds of feed fish to produce a pound of food. Although there have been developments with plant-based foods, land resources are still required somewhere to grow that feed, just as with pork or chicken. In addition, farm-raised fish that consume plant feed tend to have lower levels of essential fatty acids. Antibiotic and pesticide use in open-ocean aquaculture systems can be problematic for the surrounding ecosystem and have a negative impact on wild fisheries (Cole et al. 2009, Klinger and Naylor 2012).

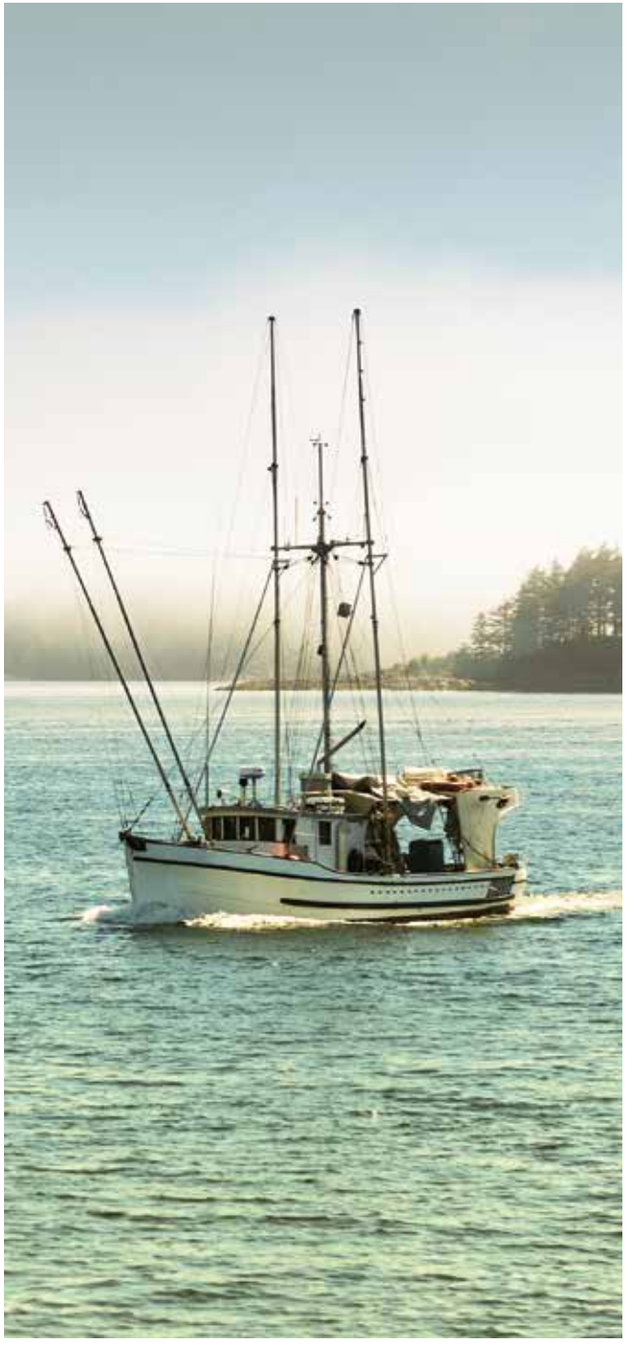
Bivalve aquaculture as practiced in open water has fewer negative environmental impacts. In fact, it can help to maintain water quality, as bivalves consume algae and filter water. As with any type of monoculture production system, however, scale is important in maximizing the health of the product and the ecosystem (Dumbauld et al. 2009).

INCREASING SUSTAINABLE SEAFOOD PRODUCTION

Multiple anthropogenic and ecological factors will influence the future productivity of our fisheries. A broad set of considerations should guide the regrowth and ensure continued abundance of fish stocks to provide a rich and varied diet for New England's growing population.

- **Prioritize healthy watersheds.** Most of New England's waterways were once dammed and badly polluted in order to support industrial and municipal growth and produce power, and many have not fully recovered. In addition, increasing populations near the coast and the use of persistent chemicals in manufacturing, agriculture, and other industries are shown to bioaccumulate in fresh and marine water bodies and in the flesh of fish that inhabit those environments (Dórea 2008, Blocksom et al. 2010). To protect the health of this food source and so our own heath, we need to be vigilant about mitigating the impact of changes in land use on water quality and the future of our fisheries.
- **Consider how multiple uses of marine spaces may impact wild fisheries.** We must carefully study and manage uses such as hydroelectric, aquaculture, increased boat traffic, wind projects, and recreation to protect optimal habitat for clean, healthy aquatic food production.
- **Protect and restore keystone species and spawning and nursery areas wherever possible.** Dam removal and fishway construction are essential to reopening spawning grounds for sea-run species of fish, such as river herring. These species are key prey for groundfish, valuable bait for fishermen, and potentially a large source of food for humans, as they were in the past. In some cases removing a dam provides greater benefits to ecosystems and people than leaving it in place (American Rivers 2002, Lichter and Ames 2012).
- **Address consumer education.** Most consumers of fish and seafood are unaware that local fish, like agricultural products, have a season of availability. They also lack basic skills for handling and cooking unprocessed or minimally processed fish. Educating consumers is an important step in supporting sustainable seafood production in the region, increasing the market for a wider diversity of sustainably harvested species.
- **Support region-wide, ongoing research around climate change impacts.** Climate change is already affecting New England fisheries and will create new challenges, and possibly opportunities. We must prepare for it by making sure we can identify and meet the needs of fisheries to adapt to and profit under these new conditions.
- **Develop diverse and adaptive processing capacity.** Revamping New England's processing facilities would make better use of a wider range of locally harvested fish as food and maximize nutrient recycling in the region.
- **Analyze input cost and availability.** Costs of inputs, including fuel, are rising, and many key inputs, such as bait, are increasingly imported to meet the need of our fisheries. This may not be an affordable or sustainable option. We must think about how we will harvest and process fish in a different energy future.
- **Adopt policies that support regulatory structures and management strategies that are flexible and allow for shifting ecological and economic conditions.** We must address many layers of policy to support not only sustainable but regenerative fisheries. To assure a healthy fishery for New England, we should explore numerous options, from species management to protecting waterfront access for operators of all sizes.

Ultimately, the ocean *could* produce an abundant amount of food with far less energy input than any artificial system. Protecting the health of ocean ecosystems should be the top priority, no matter what the exact mix of production and harvesting activities.



Regional Reliance:
Maximizing New England Food Production in Time of Need

What if in the future a combination of world population growth, environmental degradation, and high energy costs makes food much more scarce and expensive? What if the cost of importing fruits and vegetables becomes nearly prohibitive, grain is in short supply, and New England needs to maximize food production? How much could be produced here?

With dramatic changes in people's eating habits and in what is grown, the region might produce a bit more than two-thirds of the food required for a healthy diet for all New Englanders. This would require a more plant-based diet, greater farm acreage, and changes in production. Few would desire such a future, but it is worth estimating what might be possible if the need arose.

The Regional Reliance diet remains healthy and diversified and is similar to Omnivore's Delight, but with half as much meat: the high cost of feeding grain to livestock plus the conversion of pastured cropland to grain for human use reduces meat production. The loss of meat is balanced by greater consumption of beans, soy, and nuts, most of which are grown in New England. Regionally grown fruits entirely replace imports.

Providing two-thirds of our food involves an increase from 6 million to 7 million farm acres and a dramatic reallocation of crops. Additional acres can be found without driving regional forest cover below the Wildlands and Woodlands goal of 70%. Land devoted to fruits and vegetables in and around cities doubles to 500,000 acres, mostly in southern New England, stemming the increase in developed land. In a world of more expensive food and energy, there would be stronger incentives for compact green development and for dedicating urban green space to small-scale food production with intensive gardening and permaculture. An additional 750,000 acres of forest clearing provides enough pasture to support as much grass-based milk production as Omnivore's Delight but much less beef. More sheep and goats use marginal grazing more efficiently than cattle alone. More than 1 million acres of cropland shift from grass to growing beans and grain, bringing the region closer to providing all the grain for people to eat. Doubling fruit acreage from the already ambitious half million acres in Omnivore's Delight to 1 million acres and ceasing imports of warm-climate fruits meet all the region's fruit needs. There might also be opportunities for silvopastoral and agroforestry systems on marginal grazing lands, which could help expand fruit and nut production.

Under Regional Reliance, New England still imports more than half of its grain and almost all of its vegetable oil, sugar, coffee, tea, chocolate, wine, and spices. Global scarcity and high cost might drive down some of these imports.

Regional Reliance is an option few would welcome. It projects a healthy diet that is more plant-based than most Americans are accustomed to or might choose, and it increases strain on the environment through greater forest clearing and intensive tillage. No one can predict the future, but it is worth knowing that if pressed, New England could probably produce two-thirds of its own food.

Figure 9. Regional Reliance Agricultural Footprint

Thousands of Acres*	NEW ENGLAND PASTURE	NEW ENGLAND CROPLAND	NON-NEW ENGLAND CROPLAND	TOTAL FARMLAND NEEDED
1 **Vegetables**		530		530
2 **Fruit**		990		990
3 **Grain, beans, and oil**		1,610	1,390	3,000
4 **Livestock**				
Dairy	1,780	890	290	2,960
Beef, sheep, goats	720	360	20	1,100
Horses		80	40	120
Swine			220	220
Layers			330	330
Broilers			300	300
Turkeys			180	180
Subtotal	*2,500*	*1,330*	*1,370*	*5,210*
5 **Other foods**				
Nuts		20	70	90
Sugar			100	100
Coffee, tea, chocolate			670	670
Wine			80	80
Subtotal		*20*	*920*	*930*
6 **Other agricultural products**		30		30
TOTALS	**2,500**	**4,500**	**3,670**	**10,670**

*rounded to the nearest 10,000 acres (totals may not sum correctly)

NUMBER OF ANIMALS IN NEW ENGLAND
Dairy cows 700,000
Beef animals 500,000
Lambs 2,300,000
Pigs 1,200,000
Laying hens 19,500,000
Broilers 90,200,000
Turkeys 13,300,000

In a world of greater scarcity, agricultural acreage in New England (green bars) expands in order to provide a larger part of the more plant-based Regional Reliance diet for 17 million people. Agricultural land in New England increases to 7 million acres, compared to 6 million acres in the Omnivore's Delight scenario and less than 2 million acres today. New England produces all its vegetables and fruits by eliminating oranges, bananas, and other warm-climate fruits and by increasing production of New England apples, grapes, and berries. The Regional Reliance diet contains less meat, shifting tillable acreage within New England from forage to cropland in order to produce all the region's legumes and a greater share of its grains. The region still relies on 3.7 million acres elsewhere (yellow bars) for grains, nuts, vegetable oils, sugar, beverage crops, and other foods. New England farmland accounts for two-thirds of the 10.7-million-acre agricultural footprint that supplies what New Englanders consume.

	1,000 ACRES	PERCENT
New England total	7,000	69%
Non-New England total	3,670	34%
Total Footprint of New Englanders	**10,670**	**100%**

Per capita footprint of New Englanders **0.6 acres**

Environmental Sustainability

Environmental sustainability is a core principle of *A New England Food Vision*. Farming and fishing are by nature ecologically disruptive. Tripling regional farmland acreage runs the risk of greater environmental impacts. How can New England raise more food sustainably?

ENERGY

Reducing energy consumption in the food system is complicated. More important than simply limiting the "food miles" that a tomato or leg of lamb travels are changes in methods of production and patterns of consumption. In *A New England Food Vision*, for example, growing more vegetables and fruits in New England is tied to both a shift toward eating more fresh produce in season and relying more on stored and preserved produce out of season and the use of low-energy season extenders such as hoophouses for cool-season crops like salad greens. A local tomato from a heated greenhouse in Vermont offers no energy dividend over one flown in from California, but a sauce made from a New England tomato in August offers great savings over a fresh import in January (Halweil 2002, Garnett 2011, Edwards-Jones et al. 2008, Smith et al. 2005). In contrast, grain, vegetable oil, and sugar are concentrated sources of calories that require less energy to transport long distances.

It is doubtful whether it makes much sense to use scarce farmland to grow biofuels rather than food. But woodlots, an important part of many New England farms, have great renewable energy potential. In addition to biofuels, woodlots provide timber for energy-efficient building materials.

CLIMATE CHANGE

Compared to other methods of production, regional farming that conserves energy, stores carbon, and reduces greenhouse gas emissions can help mitigate global warming.

Clearing farmland from forest will initially release carbon to the atmosphere from vegetation and soils. But carbon dioxide emissions can be minimized by intelligent use of harvested biofuel and lumber, replacing fossil fuels. Subsequently, well-managed pastures and fields can store carbon in the soil as grass and legume roots grow and decay, manure is recycled, and grains and vegetables are rotated with leguminous hay and cover crops (Boody et al. 2005, Clancy 2006).

Maintaining high levels of soil organic matter is key to sustainable farming (Clancy 2006, Conant 2010, Follett et al. 2000, Gurian-Sherman 2011, Smith et al. 2008). Increased organic content adds to a soil's nutrient- and water-holding capacity. As organic matter in the soil binds nitrogen from manure or fertilizer, it also helps to prevent volatilization of nitrous oxide (N2O), a potent greenhouse gas (Rotz et al. 2005).

The most important reduction in greenhouse gas emissions in *A New England Food Vision* comes from the sharp reduction in meat (particularly beef) consumption (Garnett 2011). In addition, feeding cattle and sheep on pasture requires less energy and hence produces less CO2 than when stock are confined and fed grain. However, cattle are a significant source of methane, and shifting cows to a pasture-based diet may increase emissions of this powerful greenhouse gas. This can be minimized if cattle graze high-quality pasture rather than coarse, older grasses (Gurian-Sherman 2011). Efficient aerobic composting or anaerobic biogas digestion in dairy barns can either eliminate or capture methane while transforming manure into fertilizer (Weiske et al. 2006).

As for the impact of climate change, longer growing seasons and abundant rainfall (Frumhoff et al. 2007) may make raising vegetables easier and extend pasture-based livestock production. On the down side, more extreme temperatures, droughts, and floods are likely. Insect pests and diseases may flourish in a warmer climate—witness recent outbreaks of late blight in tomatoes and potatoes. Traditional crops such as cranberries and maple syrup may decline. Growing a wide range of crops and varieties will be important to build resilience into New England agriculture.

WATER

A great expansion of New England agriculture raises concern for water quantity and quality. Nothing equals forests at protecting water (National Research Council 2008). Clearing several million acres of forest and bringing so many more farm animals into New England will represent a substantial new impact.

Worldwide, agriculture is the single largest consumer of water. Even in well-watered New England, many vegetables and fruits rely heavily on irrigation during dry periods. Dairy cows require large quantities of water: 3 gallons of water intake are needed for each gallon of milk produced (Ross 2004, 2005; DeLaval 2013). Expanded agricultural production will compete with residential, industrial, and commercial users and the needs of aquatic wildlife for limited surface water and groundwater.

Converting forest to pasture will alter the water cycle, leading to more local runoff and less groundwater recharge. All six New England states are concerned about high water temperatures and low summer baseflows in streams. We will need to pay careful attention to local watershed conditions when identifying land suitable for clearing, and we will need to take appropriate actions to minimize hydrologic disruptions (Maine Department of Agriculture, Food, and Rural Resources 2007).

Managing runoff and percolation through soil will be critical to ensuring that farm nutrients and pesticides will not harm inland water quality or damage coastal salt marshes, shellfish beds, and fisheries. In cities and suburbs, nutrients from yard wastes, food wastes, and human wastes can be recaptured, kept out of waterways, and brought into intensive agricultural production systems through safe treatment and composting. In rural New England, pasture-based livestock production seasonally disperses animals across the landscape, where their manure can be retained if soils are covered with vegetation and high in organic matter (Hubbard et al. 2004).

Protecting water quality and the integrity and biodiversity of inland and coastal aquatic ecosystems (Hapeman et al. 2002, Deegan et al. 2012) will require best management practices on farms, such as the following:

- Avoiding the overstocking of pastures with livestock
- Spreading manure and fertilizers onto fields at times and at volumes that let them be fully absorbed
- Preventing nutrients from leaking from barns or other places where stock are concentrated
- Preventing animal wastes from flowing off of pastures and other areas with winter rains and snowmelt
- Capturing and treating nutrients so that they do not enter waters
- Providing adequate riparian buffers to keep livestock and their wastes away from streams and wetlands
- Providing watering areas away from surface waters (Hubbard et al. 2004)
- Creating treatment wetlands to capture runoff, store carbon, and prevent nitrogen and phosphorus from reaching surface waters (Kovacic et al. 2006)

These measures are expensive for farmers but yield large benefits for the environment. As part of the price of sustainable farming and clean water, society needs to shoulder the costs of upgraded farm infrastructure and best practices and ensure that they are not compromised by food safety and other regulations.

BIODIVERSITY

Early successional and open-land species that flourished in New England's agrarian past now find their habitats disappearing. Adding farmland could restore many of those habitats with little additional cost to conservation.

Increased pasture and edge habitat may help hundreds of species of native pollinators, which in turn can help sustain the desired increases in farm production (USDA 2009b). Other open-land insects, grassland birds such as bobolinks, and many more animals and plants will also benefit.

Not all of these advantages will be realized automatically by expanding farmland. For example, many grassland bird species nest late in the season, in conflict with efficient harvesting of fodder (Massachusetts Audubon 2013a, 2013b). Yet on selected parts of many farms, methods such as late grazing of marginal pasture by beef cows or a single late cutting of a wetland meadow to provide coarse hay for livestock bedding can realize some productive use while boosting biodiversity at the same time.

Beaver will need to be controlled where they impede drainage and render good farmland unusable, yet elsewhere their ponds and meadows can flourish, providing important habitat for many other species (Vermont Fish and Wildlife 2004).

Socioeconomic Implications of *A New England Food Vision*

A New England Food Vision comes with wide-ranging economic and social benefits.

A THRIVING FOOD ECONOMY

Producing half of New England's food means a large expansion of the region's rural economy. The figures presented here show the economic impact of the Omnivore's Delight scenario only as far as the farm gate and the fishing boat dock—that is, the increased employment and value of food production alone. Many more jobs and larger economic value lie in other sectors in the food system, such as distribution and retail (Food Industry Center 2012). However, those sectors will exist in New England at about the same scale whether food is produced within the region or imported from elsewhere. Growth in regional food production will bring significant additional increases in some sectors such as processing, but calculating those increases is beyond the scope of this analysis.

FARMS

New England has about 33,000 farms (defined as those with production of $1,000 or more) (USDA 2009a). They include part-time, community, educational, and full-time family farms. Many are quite small, with only a few acres in production. The systems that are the focus of *A New England Food Vision* —intensive vegetable growing (much of it in urban and suburban areas), fruit and orchards, pastured livestock—are well suited to small and medium-sized farms. Much of the expanded acreage may well be found within existing farms that presently do not completely meet their food production potential; some will come through the creation of entirely new farms. With triple the farmland, a rise to 50,000 or more New England farms seems likely.

Farm production is projected at more than three times today, greater than the increase in acreage (Figure 10). The direct wholesale value of farm food production, in constant dollars, is projected to rise from less than $2 billion in 2007 to $6.5 billion in 2060. Vegetables, dairy, fruit, and poultry each account for over $1 billion. Future farm employment is tricky to estimate because most New England farmwork is part time. About 111,000 people were employed on farms in 2007, including both operators and hired labor, but a large majority in each category were part-time workers (Food Industry Center 2012). Our analysis suggests that in 2007 about 24,000 New England farms produced food, with 39,000 operators (often a couple farming part time) hiring the equivalent of 19,000 full-time workers. For 2060, we project at least 50,000 food-producing farms with 80,000 operators spending on average more time working their farms and hiring the equivalent of 52,000 full-time workers (see website for details).

FISHERIES

In 2008, New England's commercial fisheries generated $808 million in landings revenue, 64% of which was shellfish (primarily lobster and sea scallops) and the rest finfish. The small (9%) projected increase in landings in 2060 will keep direct revenues close to $1 billion. Besides commercial fishing, nearly 1.4 million recreational anglers fished in coastal waters, supporting more than 13,000 full- and part-time jobs (NMFS 2009b). Aquaculture has been growing rapidly in recent years, reaching nearly $150 million in sales in 2011, but we have not attempted to project future growth (USDA 2012).

◄ Greenhouse, nursery and floricultural production accounts for about 25% of New England agricultural sales, while occupying only about 2% of the farmland. Such crops could expand without measurably impacting food production, while providing a strong boost to the farm economy.

FARM AND FOOD INDUSTRIES

New production will be accompanied by increases upstream in farm supplies and services and downstream in food processing. Projecting economic impacts is difficult because many of these industries scarcely exist in New England today. Here are some potential areas of growth:

- Manufacturing and distributing farm tools and equipment, barns and greenhouses, and regionally adapted seed varieties and livestock breeds
- Producing and supplying fertilizer, animal pharmaceuticals, and energy
- Recycling biomass and nutrients and producing fertilizers—woodchips, shavings, biochar, whey, offal, farm and seafood wastes, compost
- Food processing—slaughtering, butchering, meatpacking, canning, freezing, dairy processing (milk, cheese, yogurt, ice cream), rendering, baking, cooking (salsas, sauces, pickles, soups), cider- and wine-making, brewing, distilling
- By-product processing—tanning, leatherwork, spinning, weaving
- Food distributors—wholesalers, independent grocers, regional chains, farmers' markets, co-ops
- Locally and regionally sourced diners, restaurants, catering, cooking classes, and institutional cafeterias
- Educational institutions at every level helping people learn how to grow, process, and cook regionally grown food
- Agrotourism, and an attractive landscape and food culture for tourism in general.

BUILDING FOOD SYSTEM CAPACITY

The expanded food system will produce new businesses and jobs, add to property values, generate new revenues, and strengthen the urban, rural, and coastal social and economic fabric of New England.

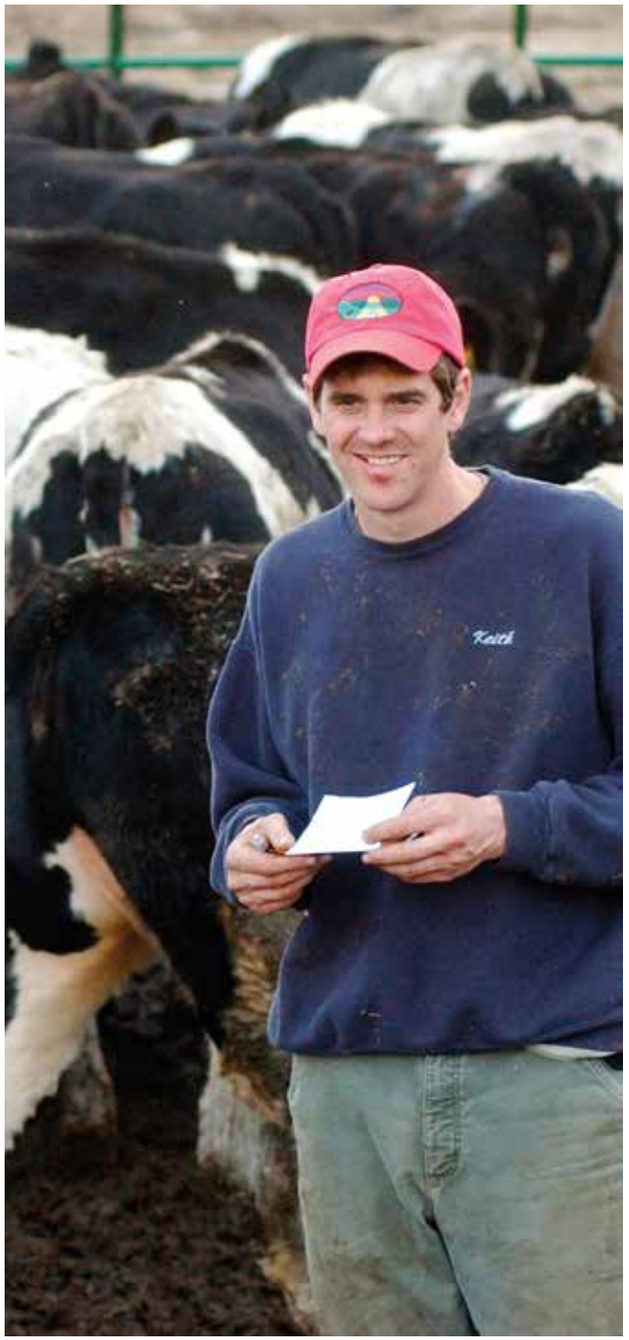
► ***Full-time Producers.*** Producers whose income comes primarily from farming or fishing are the backbone of *A New England Food Vision*. Such farmers and fishermen provide entrepreneurial innovation and drive. To succeed they must get a fair price and have access to land or fishing rights, credit, and affordable health benefits. A sustainable food system needs to compensate farmers for protecting land and its social and environmental benefits—for example, by purchases of conservation easements, carbon credits, and other payments for ecosystem services.

► ***Part-time Producers.*** Small-scale production provides satisfaction, healthy food, and many social benefits. Home and community gardens, small livestock production (particularly eggs), and small-scale aquaculture can supply a lot of food. Much can be grown on small urban and suburban lots. Part-time and hobby farmers include retirees, families with full-time off-farm jobs, and multifamily partnerships. Gardeners and part-time farmers help support the agricultural infrastructure all farmers need.

► ***Education.*** Nonprofit community and educational farms engage many people, especially children, with food and farming. Programs range from school gardens and greenhouses to commercial-scale farms that train future farmers (Farm-Based Education Network 2014). Especially in cities and suburbs, such educational programs are a good way to help people learn about and develop a stake in growing food and supporting local producers. Future Farmers of America (FFA), 4H, Farm-to-School, and other community programs can introduce young people to growing food. New England needs such programs in every community.

Farmers' markets, fish markets, groceries, restaurants, radio and television advertising, social media, granges, farm and fishery organizations, social service agencies, schools, health providers, and community organizations all have roles to play in educating consumers about healthy eating, different kinds of foods, and ways to prepare nutritious and delicious meals. This is important for all New Englanders but especially for those who traditionally have not had access to fresh, healthy food.

► ***Food System Workers.*** Seasonal workers, often from abroad, have long been key to New England food production (Doeringer et al. 1986, Freidberg 2009). Society needs to support decent wages for workers and pay a fair price for sustainable food. Food needs to be grown efficiently, but cutting corners and producing



food as cheaply as possible will not build thriving communities. There is no reason why food system jobs should be poorly paid: pruning apple trees, managing crops and grazing systems, and preparing healthy meals all require skills that deserve a living wage (Yen Liu 2012).

Many young people, whether native to New England or here to go to school, discover a taste for farming through seasonal employment and farm internships. If just a few remain in agriculture, they will help supply the oncoming generations of farmers. The rest will have learned valuable lessons about food and why agriculture must be supported. As they learn, they will supply a steady stream of willing farm labor.

► ***Access to the Means of Production.*** How will new farmers and aspiring fishermen gain access to land, boats, gear, and permits? New England must continue to protect existing farmland and forests from development, mostly through conservation easements. Those who want to farm need to be able to connect with those who have land available and have access to funding that will let them engage in farming. Innovative programs are emerging to connect ambitious young farmers with these landowners and provide them with housing and working capital. Similarly, fisheries policy must support a broad array of small as well as large operators.

Figure 10: New England Farm Production

Millions of Dollars	2007	OMNIVORE'S DELIGHT 2060
Vegetables	$461	$1,622
Fruit	$298	$1,385
Grains, beans, and oil	$12	$72
Dairy	$759	$1,576
Beef	$108	$523
Sheep and goats	$4	$64
Pork	$5	$130
Eggs	$145	$793
Chicken and turkey	$19	$383
Maple syrup	$47	$54
TOTALS	**$1,858**	**$6,602**

The Omnivore's Delight scenario would increase the value of food production in New England by more than three times. Vegetables, fruits, dairy, and combined poultry products all rise to over one billion dollars. While grain, beef, lamb, and pork reach lesser totals, the increase in production compared to today is impressive. These figures represent only the wholesale value at the farm gate, not the value added by processing, preparation, or retail. Fish landings (which would rise to close to one billion dollars) are not included. Neither are non-food agricultural products such as hay for horses, nursery stock, and flowers. This Food Vision would have a dramatic positive economic impact in rural and coastal New England.

From Vision to Collective Action

Helping people learn how to grow, prepare, and enjoy healthy food within a broad range of tastes and traditions, while embracing practices that keep future generations in mind, is key to this vision.

A New England Food Vision is bold in aspiration—healthy food for all, sustainable farming and fishing amidst thriving communities; and bold in scope—a tripling of land in food production, vibrant working water fronts, healthy ecosystems, viable food enterprises from farm and fish to fork, no one going hungry. The seeds of change required to make such a transformation are here in the present, but how will they grow to fruition? What kinds of actions and forms of organization are called for? Clearly, it will take policy changes to align governance and market dynamics with the values that underpin this vision. It will also take new initiatives in all sectors and a sustained effort at all levels of the food system—household, local, state, regional, and national.

The transition has already begun. Food system planning efforts are under way in every New England state and many municipalities. Stories of renewal and renaissance of community values and collective action connected with food are growing across the region. A dynamic food vision project that combines values and action will mean ongoing dialogue and learning that will yield new ways of thinking about how to manage our common resources and how to work collaboratively to allow the transition to reach its full regional scale. Below are a series of policy initiatives that will lead in the right direction.

ACCESS TO FOOD

This vision of New England's food system is premised on the right to healthy food. Such food will not be cheap; it is liable to cost more on average than food does today because it will require more attention to social and environmental consequences. If everyone is to have access to healthy food, people must be able to afford it or must be helped to afford it. The costs of providing healthier food can be far less expensive than the health care costs of disabilities associated with poor dietary practices (Rao et al. 2013, US Burden of Disease Collaborators 2013). Food might be made more accessible in several ways:

Secure a living wage for every person who is able to work and sufficient jobs for all. The current minimum wage is far below the amount needed to provide for living expenses of a household, and many able-bodied people who want jobs cannot find them. A living wage varies depending on place but must cover basic needs such as shelter, utilities, transportation, clothing, education, childcare, and medical expenses, in addition to food. Although people in the United States spend less on food as a proportion of their disposable income than people in any other industrialized country (Thompson 2013), this is partly because of the higher costs of other basic needs, especially medical expenses, education, and housing. In New England a living wage for full-time work varies from

$22.40 per hour (for a household with two adults and two children) in Boston to $17.49 in Aroostook County in northern Maine (Glasmeier 2013). People in rural areas can get by on lower wages than those in metropolitan areas, but they also tend to have fewer job opportunities. Rural areas with robust food and forest economies would provide more jobs at living wages than they do now.

Redirect federal agricultural subsidies to support sustainable fishing and farming. Production of certain crops is heavily subsidized today, through payment programs or subsidized insurance for commodities such as corn and soybeans. This system of subsidies could be shifted instead to support sustainable farming and fishing practices, which would simultaneously reward producers for providing environmental benefits such as clean water and carbon stored in soil and lower the cost of healthy, local food to consumers.

Ensure that every household that wants to grow its own food is able to do so, either on its own property or in common space such as a community garden. Community gardeners need secure access not only to land but also to water, compost or other fertilizers, tools, and seeds. Growing one's own food can provide no more than a supplement to purchased food for most New Englanders. But in the process it also yields benefits such as exercise, social interaction, and increased consumption of fruits and vegetables.

Provide places where those who cannot afford to buy food can obtain healthy, local food in dignified ways. Communities might help people meet their food needs by setting up markets with low, fixed prices for staples (including vegetables and unprocessed foods) along with places where people can buy a healthy prepared meal for a low price. Schools, churches, and town commons would be ideal sites for community meals, which could be combined with farmers' markets, adding something vital to existing government and charitable food programs, such as SNAP benefits, soup kitchens, or food pantries. Meals would be accessible to anyone, without the need for proving eligibility, which would help to preserve recipients' dignity. Given that low-calorie, healthier food is typically expensive and sometimes unavailable (Drewnowski 2010), these markets would provide a site to purchase wholesome foods at reasonable prices. These programs would be administered by each community for the benefit of its own residents (although ideally with state or federal support). They would focus on getting food grown locally and regionally to residents, not on distributing "surplus" commodities or donations of products with low nutritional value.

Such measures are in keeping with fundamental New England values of independence and self-sufficiency, combined with generosity toward neighbors who are in need. Continued commitment to job training, sufficient opportunities at livable wages, access to affordable housing, and increased supplies of locally and regionally produced food would fit together to make this system work.

The right to healthy food must ultimately be guaranteed by government at every level, from the local community to the nation. Ensuring all are food secure has broad societal benefits, and achieving it will require a broad societal effort.

HEALTHY DIETS

Diet is a matter of personal choice. Yet how people eat (across an entire population) also has broad public health consequences—costs and benefits that one way or another are shared by society as a whole. The modern American diet has enormous health costs. Five of the top causes of death in the United States are considered diet related, and care for people suffering from diet-related diseases, including type 2 diabetes, stroke, and Alzheimer's, is hugely expensive (World Health Organization 2003, Scarmeas et al. 2009, Hoyert and Xu 2012, CDC 2013c, US Burden of Disease Collaborators 2013). Our eating patterns are influenced by powerful forces, such as the price and availability of different kinds of foods, advertising, and cultural trends. The way Americans eat has changed many times in the past, for better and worse.

Following are some steps that can help lead in the direction of healthier average diets such as the Omnivore's Delight.

Subsidizing consumption of healthy foods (especially fruits and vegetables) so that people will be encouraged to eat more nutrient-dense foods. Programs to support healthier eating can be funded not just by the government (Fields 2004) and charitable organizations but by the health care industry as part of preventative health programs. As more Americans become insured, the health care industry has a strong incentive to help underwrite access to healthier food. This is already happening in New England through initiatives such as "veggie prescriptions," in which doctors provide vouchers that can be redeemed for vegetables at local farmers' markets (Singer 2010).

Promoting widespread food preparation and educational programs. Current food education or counseling has often focused on a narrow view of health or disease intervention. An effective educational approach must go beyond calorie counting and explore food system principles. Helping people learn how to grow, prepare, and enjoy healthy foods within a broad range of tastes and cultural traditions, while embracing eating practices that keep future generations in mind, is one key to the success of our vision for New England food (Burke 2012). School systems, community education programs, and the health care industry have complementary roles to play in food education.

Expanding farm-to-plate programs in schools, hospitals, and other institutions. While much of the focus on eating sustainably is at the individual and family levels, an emphasis on institutional purchases of sustainable foods, such as through schools and hospitals, can exert a positive influence on community food systems. What people eat in such places may have a profound effect on what they choose to eat elsewhere.

Promoting a broader base of positive food system values, such as the one presented in this New England food vision. As Wendell Berry put it, "Eating is an agricultural act." If people know they are part of a larger movement to support local farmers and fishermen in raising food sustainably, they find it easier to change eating habits—for example, the amount and type of meat they consume (de Boer et al. 2007). Similarly, a high degree of involvement in food has been linked to a preference for organic food products (Schifferstein and Oude Kamphuis 1998). Tips on sustainable eating at the website of the American Academy of Nutrition and Dietetics suggest a host of related concerns (Moores 2013): shopping locally, growing some of one's own food, initiating conversations about food, eating seasonally, and retooling grocery lists.

A multipronged approach is essential to changing food consumption patterns. Simply providing better access to healthy food, such as by siting more full-service supermarkets in low-income neighborhoods, is not sufficient to change something as deeply engrained and personal as eating behavior.

SUSTAINABLE FARMING AND FISHING

A New England Food Vision is premised on the idea that harvesting food from land and sea must not only be reasonably efficient and affordable but also deliver a broad range of other social and environmental benefits: food of the best flavor and nutritional quality; healthy soil, vegetation, wildlife, and waters; an attractive landscape for residents and visitors alike; and a robust, fair economy with thriving communities. These interests are well served by the kind of agriculture that has long characterized our region: a large number of small and medium-sized producers working with modern tools and science as well as traditional knowledge. Yet nationally, our food production system is heavily weighted (both economically and politically) in favor of increasingly large operations that drive hard for the lowest possible cost.

If farmers and fishermen are to serve as stewards of the New England landscape and meet the highest environmental standards yet remain in business, we need policies that strongly support them in doing this work on our behalf. Some of these—for example current use taxation that reduces real estate taxes on farmland and Natural Resource Conservation Service programs that assist farmers in carrying out projects that enhance wildlife or environmental quality on their land—are already in place. But we need many more.

Protect farmland (and forest) through programs that purchase easements from landowners, allowing them to realize a large part of the market value of their property while it remains in their own hands, free from development. If New England is to become more self-reliant in food, we must start by protecting our remaining farmland, along with the surrounding woodlands that convey large benefits of their own (Foster et al. 2010). Many land trusts across New England are vigorously protecting land, and each of the six states has agricultural preservation programs as well. These programs are not lacking for willing owners who wish to protect their land; what they need is dramatically increased funding.

Promote farmland access and training programs for beginning farmers. Many young people want to get into farming and have spent years working on farms to master the skills needed, but land in New England is expensive. Young farmers also need assistance with preparing viable business plans, plus access to credit, insurance, and other support. Many aging farmers have most of their wealth and retirement assets tied up in their land, making passing the farm on to the next generation—even within the same family—very difficult. Again, state agencies and nonprofit organizations such as the American Farmland Trust, Maine Farmland Trust, New Entry Sustainable Farming Project, the Carrot Project, and Land for Good are tackling this challenge of supporting beginning farmers and connecting them to land.

Pass and enforce strong environmental regulations that, for example, protect waterways, rebuild fish stocks, and reduce carbon emissions, but combine these with incentive programs that help farmers and fishermen put these safeguards in place. Examples include payments for sequestering carbon, providing riparian buffers that absorb nutrient runoff, collecting data to help monitor fish populations, providing habitat for open-land species, and making capital improvements such as state-of-the-art manure handling. Such incentives are especially needed to level the playing field where similar measures are not in force in other regions with which New England's producers must compete.

Invest heavily in distribution networks and retail outlets that better connect farmers and fishermen with customers. Farmers' markets, food hubs (which aggregate products for larger buyers), farm- and boat-to-school programs that link producers to institutions, and incentives for grocery stores and supermarkets to locate in underserved "food deserts" and to carry high-quality local produce not only make regional food more broadly available but also often provide a better return to producers.

Adopt regulatory structures that encourage access to fishing rights for owner-operated fishing vessels. Who is fishing and how they are fishing affects resource management and sustainability. Access rules can encourage fishermen to pursue diverse fisheries so that they can fish flexibly within the means of local ecosystems rather than following a rigid, single-species extraction strategy. Fisheries management should recognize all fish as part of an ecological web and encourage diversity in marine ecosystems. Community-based management strategies can integrate the best local knowledge about available fish and their feeding and reproductive patterns. New England's waters vary greatly in their ecology, and we should enable our fishing fleet to understand and respond to that diversity.

Support the creation of community gardens, school gardening programs, and community and educational farms. The number of people (particularly young people) who become engaged with farming and learn new attitudes toward food through community programs is even more valuable than the food that is produced.

CHANGING FOOD POLICY

A New England Food Vision is not a plan, but it does challenge us to engage in individual and collective actions that spring from a set of values that are increasingly shared across our region: healthy food for all, sustainable farming and fishing, and thriving communities. Realizing this bold vision means changing our food system in ways that require initiatives at federal, state, and local levels. For example, changes in the enormous flow of agricultural subsidies and nutritional support programs need to come mostly through the federal Farm Bill, while farmland must be protected mostly by state agencies and regional land trusts who often draw upon combined federal, state, foundation, and local funding. Local and state food policy councils are one promising model for broad-based decision-making; they (or something similar) are being formed in almost every New England state.

Experience shows that the kinds of policy changes needed will result only from collaborative efforts. *A New England Food Vision* is all about choices and the kinds of dialogue, learning, and purposeful decision-making to which people commit. Whether at the backyard, community, state, or national level, two principles can help ensure a collective impact: seeing your own actions within a sustainable food system framework and working within larger collaborative networks.

KEEPING A FOOD SYSTEM FRAMEWORK IN MIND

In *A New England Food Vision* many things are interconnected. Many moving parts need to be coordinated to achieve healthy food for all, sustainable farming and fishing, and thriving communities, so this endeavor can seem overwhelming. Thoughtful and strategic simplification can make action manageable without losing sight of the big picture. The policy changes listed above illustrate a food system framework: food access, healthy diets, and sustainable farming and fishing are all recognized as being part of one interdependent system that promotes greater health and quality of life for all.

THINKING ABOUT NETWORK COLLABORATION AND COLLECTIVE IMPACT

To realize this vision means working with others toward larger shared goals. Whether you are engaged in food system work in a neighborhood school, on a farm or a fishing boat, at a local food pantry, or in one of a thousand other settings, your individual efforts are connected to those of others. There are ways to join with others to increase the impact of your own work while building trust and collaboration to strengthen collective work. Putting *A New England Food Vision* to work means pooling knowledge, insights, experience, and conviction from all parts of the system, including the most vulnerable and marginalized.

The success of this vision depends on collaborative action and collective impact, which do not happen without purposeful efforts to build networks and coalitions across race, gender, geographic, and economic divides. Many such efforts are well under way. Many more are needed, binding the farthest corners of New England to its urban centers.

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NOTES ABOUT THE FIGURES

Figure 2: Modified from Figure 1 in Foster et al, *Wildlands and Woodlands*, 2010.

Figure 3: Farmland, farm, and dairy farm data from US Agricultural Censuses, 1860 – 2007. "Farmland" from 1860 to 1920 = Improved land. "Farmland" from 1925 to 2007 = Cropland + Pastureland (excluding cropland pastured and woodland pastured). "Farmland" in 1969 = Cropland + Other pasture for farms making more than $2500. No data for New Hampshire in 1925—estimated point interpolated. Dairy production data from US Agricultural Census 1890 to 1969, from National Agricultural Statistics Service 1975 to 2009.

Figure 4: Data on New England agricultural acreage and production from 2007 US Agricultural Census. Acreage required to feed New England calculated from 2013 USDA ERS food availability data, Busby et al 2006, Peters et al 2007, and Peters et al 2009. See New England Food Vision web site for further details.

Figure 5: Data from Coleman-Jensen et al, 2013.

Figure 6: Current Diet table is estimated from 2013 USDA ERS food availability and loss data. Omnivore's Delight and Regional Reliance tables are derived from 2014 USDA "MyPlate" and 2012 Harvard School of Public Health's "Healthy Eating Plate." Each dietary pattern was analyzed using the USDA National Nutrient Database for Standard Reference #25 and #26. See New England Food Vision web site for further details.

Figure 7: Modified from Figure 9 in Foster et al, *Wildlands and Woodlands*, 2010. Land use categories "farmland," "developed," and "forest" were derived from NLCD 2006 data. 2006 acreages of each land use category within each of the six landscape types were calculated. These acreages were then adjusted for 2060 to allow for a small expansion in development, reduce forest cover but keep it above Wildlands and Woodlands limits (summing to over 70%), and produce 6 million acres of potential farmland. Mapping by Brian Hall, Harvard Forest.

Figure 8: Requirements for each food group were derived by multiplying average per capita consumption estimates in the Omnivore's Delight diet by a projected 17 million New Englanders in 2060, and factoring in loss from USDA ERS food availability data. These food requirements were then divided by reasonable yields (derived from various sources) to derive an acreage requirement for each food. The resulting acreage footprint was then divided between 6 million acres in New England and land elsewhere. See New England Food Vision web site for further details.

Figure 9: Followed the same procedure as Figure 8, except using the Regional Reliance diet and allowing 7 million acres of farmland in New England. See New England Food Vision web site for further details.

Figure 10: Economic analysis by Nicholas Rockler of Kavet, Rockler and Associates. See New England Food Vision web site for further details.

PHOTOGRAPHS

Front Cover: Cultivating Community, Portland, ME; Inset: Cite Ecologique, Colebrook, NH, MiFluerDesign
Page 1: Jasper Hill Fram, Greensboro, VT, Dennis Curran; Pete's Greens, Craftsbury, VT; Pete and Jen's Backyard Birds, Concord, MA, Pete Lowy (pigs and eggs); New Hampshire Community Seafoods, Sarah VanHorn
Page 2: Denis Tangney, Jr.
Page 4: Northwest Atlantic Marine Alliance, Gloucester, MA; Pete and Jen's, Pete Lowy; Chase's Organic Farm, Mapleton, ME, Laura Chase (hay and cow)
Page 10: Cultivating Community (boys, woman, and market); Micmac Farms Farm Store, Presque Isle, ME; University of Maine Extension, Edwin Remsberg
Page 11: Shelburne Farms, Shelburne, VT, Vera Chang
Page 12: Shelburne Farms, Vera Chang
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Page 15: Jasper Hill Farm, Greensboro, VT, Bob Montgomery; Maine Organic Farmers and Gardeners Association, Jean English;Jasper Hill, Colin Clark
Page 17: Cultivating Community; Jasper Hill, Denis Curran
Page 18: Viktor Kitaykin; Jeb Wallace-Brodeur; Seacoast Eat Local, Sugar Hill Farm, ME
Page 19: Pete and Jen's, Pete Lowy
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Page 22: Pete and Jen's, Pete Lowy
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Page 33: Digger's Mirth Collective Farm, Intervale Food Hub, Burlington, VT; Intervale Food Hub farmers, Intervale Center, Burlington, VT; Hartford Food System, Hartford, CT; Shelburne Farms, Vera Chang
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Back Cover: Chase's Farm, Laura Chase

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