



THE HEALTHY FARMLAND DIET

*How Growing Less Corn Would Improve Our
Health and Help America's Heartland*

While the federal government and leading nutrition experts call on Americans to adopt a healthier diet, including more fruits and vegetables and less red meat, the nation's massive agricultural land base today is not producing that healthy mix. Much of the food grown on U.S. farms takes the form of crops—largely corn and soybeans—that become processed food ingredients, feed for livestock, and raw materials for energy production. Corn alone is grown on 97 million acres, or nearly one-fourth of the nation's agricultural land, and is responsible for well over one-third of total U.S. food production by calorie content (Kirk 2011). Fruits and vegetables, by contrast, account for just a small fraction of U.S. farm acreage. Meanwhile, skyrocketing rates of diet-related illnesses are cutting lives short, reducing our quality of life, and driving up our national health care bill.

Aligning U.S. farm production with nutritional objectives would make far greater sense. But if the majority of Americans started consuming more fruits and vegetables and less junk food and meat, would U.S. farmers and farmland be able to adjust? What would it take to spur the requisite changes in supply

and demand? And beyond improved nutrition, would any other benefits accrue from such a shift?

This report uses an economic model of global trade flows to investigate how the U.S. farm landscape would be altered if Americans started eating more healthfully. To our knowledge, this is the first time that such an economic model has been so applied. We estimate how changes in demand for certain kinds of foods, and associated price shifts, could affect the supply and demand for other goods and food products, both domestically and through international trade.

Our analysis finds that transitioning the American diet to one that includes less processed food and meat, and more fruits and vegetables, would significantly shift today's corn- and soybean-dominated farm landscape to one that is more diversified. In turn, a landscape that produces a healthier mix of crops and livestock for local and regional markets can have positive effects—not only in improved nutrition and health for consumers but also in the form of significant benefits for the environment and farm country's local economies. It will take forward-looking policies to facilitate such a conversion, however, as it is no accident that our



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Most Americans, including children, are not eating enough fruits and vegetables to meet daily dietary recommendations.

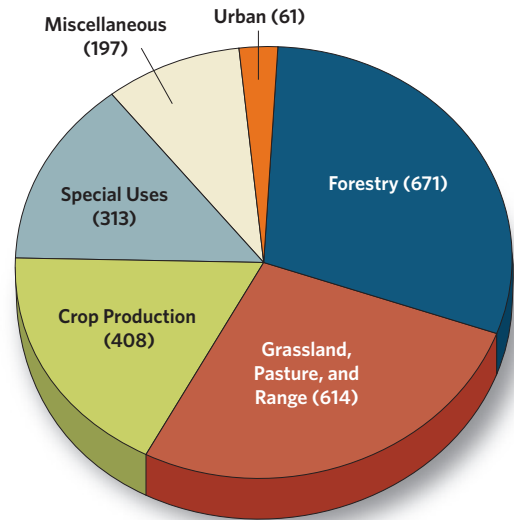
farm landscape looks the way it does. Decades of short-sighted decision making have created our current entrenched agricultural system. A new approach to farm policy—one that prioritizes the nation’s nutritional goals as well as its environmental, land use, and rural economic goals—is needed to help us change course.

Our Unhealthy Farm Landscape

U.S. farmers grow crops on 408 million acres, or 18 percent of the country’s land base (Nickerson et al. 2011), and crop production is the third-largest use of land in the United States—after forests and the combined category of grassland, pasture, and range (see Figure 1). But it has been evident for several decades that the U.S. agricultural landscape does not produce the mix of crops needed to support healthy diets (O’Brien 1995). Among U.S. crop sectors, cereal grains (including corn, sorghum, barley, and oats) constitute the largest harvested acreage, followed by oilseeds (such as soybeans); “other crops” (a catchall category that includes legumes and alfalfa); wheat; and, way down in fifth place, vegetables, fruits, and nuts (Figure 2). Together, cereal grains and oilseeds represent 59 percent of U.S. crop acreage while vegetables, fruits, and nuts account for only 2 percent. Prominent uses of corn and soybeans include fuel (ethanol and biodiesel), livestock feed, and ingredients (such as high-fructose corn syrup) for a plethora of products rightfully referred to as junk foods—highly processed and with low nutrient density.

This distribution of cropland is incentivized by farm policies that provide subsidies for farmers to grow select nonperishable “commodity” crops—e.g., corn and soybeans. Moreover, farmers who receive such subsidies are prohibited from planting any acreage with fruits and vegetables (unless certain highly prescribed conditions are met). In addition, the insurance program administered and subsidized by the U.S. Department of Agriculture (USDA) is oriented toward farmers who grow a handful of subsidized commodity crops, often

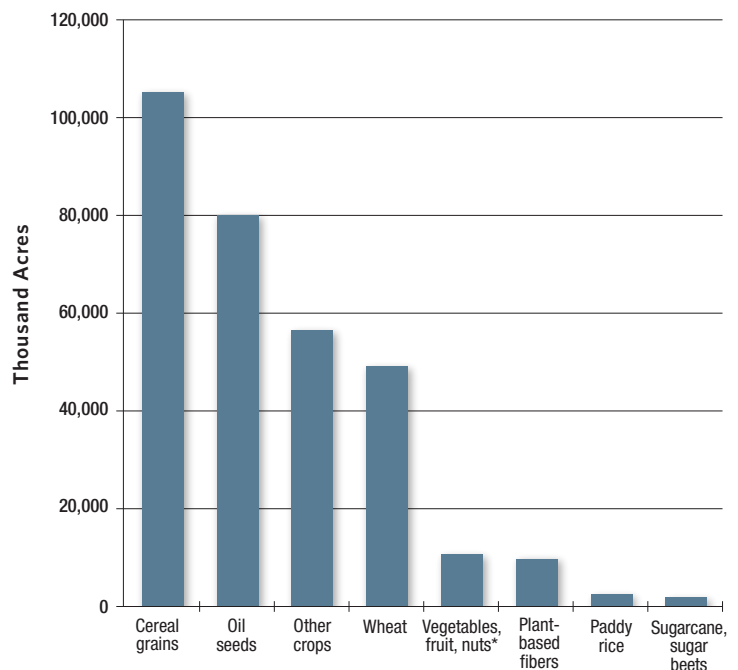
Figure 1. U.S. Land Use by Type (million acres)



Source: Nickerson et al. 2011.

Note: “Special uses” primarily consist of parks and wildlife areas. Examples of “miscellaneous” lands include tundra and swamps.

Figure 2. 2012 U.S. Crop Acreage



* Reported until 2011

Sources: USDA NASS 2013; USDA ERS 2012a; USDA 2012b.

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leaving many fruit and vegetable farmers (particularly those growing a variety of crops) without access to adequate insurance and thus poorly positioned to obtain needed credit (O'Hara 2012).

Shifts in U.S. Eating Habits Would Change Our Farm Landscape

Three previous studies have estimated changes in U.S. crop acreage that would result if Americans' eating habits aligned with federal dietary guidelines (Ribera, Yue, and Holcomb 2012; Buzby, Wells, and Vocke 2006; Young and Kantor 1999). These studies assumed that fruit and vegetable acreage would rise in proportion to hypothetical increases in demand, and one of them also estimated changes in crop acreage resulting from decreased meat and processed food consumption under a healthy diet scenario. Other studies have examined either the

economic or landscape impacts of changes in diet (Mukhopadhyay and Thomassin 2012; Arnoult et al. 2010; Lock et al. 2010; Wirsenius, Azar, and Berndes 2010; Rickard and Gonsalves 2008), but until now, no study of which we are aware has used sophisticated economic modeling to estimate the changes in U.S. crop acreage that would result from shifts in the U.S. diet.

With the aid of such a model,¹ we estimated the market changes that would result from Americans' healthier food choices. To present a range of possible outcomes, we constructed scenarios of diverse U.S. food consumption patterns (summarized in Table 1) that reflected either the federal dietary guidelines or the alternative recommendations developed by nutrition experts at Harvard University (Harvard School of Public Health 2011; USDA and HHS 2010). We then estimated how the outputs of various food sectors would change in response to the scenarios' hypothetical consumption changes. We further modeled how production choices would affect the use of inputs in these sectors, such as farmland and, in the case of meat or dairy products, animal feed. For example, a reduction in beef consumption would decrease the demand for grains, such as corn, that are used in cattle feed.

Table 1. Food Consumption Scenarios (in percentage changes from present overall demand)

Scenario	"F&V" (Scenario 1)	"Harvard Dairy" (Scenario 2)	"MyPlate Dairy" (Scenario 3)	"Harvard Protein" (Scenario 4)	"MyPlate Protein" (Scenario 5)	"Harvard P&D" (Scenario 6)	"MyPlate P&D" (Scenario 7)
Fruits and Vegetables	173%						
Dairy		-33%	100%			-33%	100%
Red Meat				-88%	-50%	-88%	-50%
Poultry				8%	-40%	8%	-40%
Seafood				149%	260%	149%	260%

F&V = fruits, vegetables, and nuts

P&D = protein and dairy

Dueling Dietary Recommendations: “MyPlate” versus “Healthy Eating Plate”

As anyone interested in personal nutrition knows, dietary advice varies widely. For the purposes of this study’s analysis, we considered two highly regarded sources: the federal government’s *Dietary Guidelines for Americans 2010*, developed by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services; and alternative advice from nutrition experts at Harvard University’s School of Public Health. The federal advice is simplified for consumers in the user-friendly “MyPlate” icon, while Harvard’s advice is shown in the similar-looking “Healthy Eating Plate.”

Both recommendations include substantial increases in fruit and vegetable consumption for the average American. But they differ significantly in their levels of protein (primarily meat) and dairy consumption. The government’s MyPlate recommends that Americans double their dairy intake, reduce their consumption of “red meat” (including beef, pork, veal, and lamb) by 50 percent, and reduce consumption of poultry by 40 percent. By contrast, Harvard’s Healthy Eating Plate recommends less dairy consumption, more poultry, and less red meat relative to the federal guidelines.

According to the Harvard researchers who developed the alternative guidelines, “the Healthy Eating Plate . . . is based exclusively on the best available science and was not subjected to political and commercial pressures from food industry lobbyists” (Harvard School of Public Health 2011).

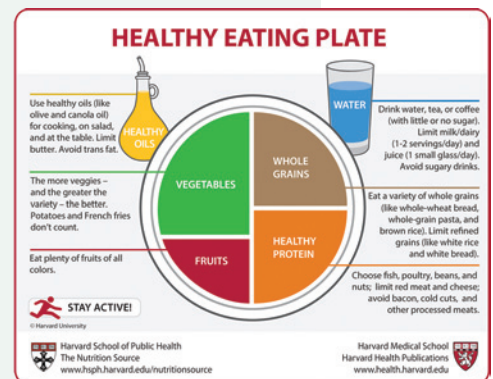
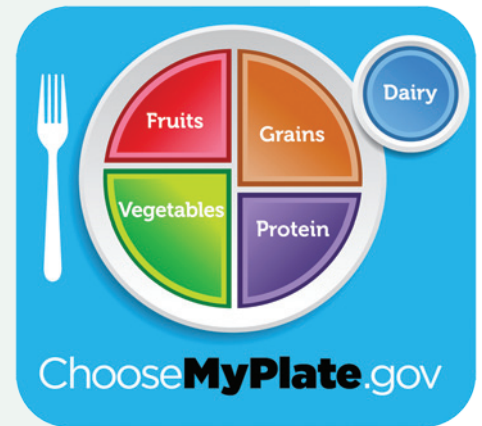
Further details about the model and our methodology are available online in the technical appendices at www.ucsusa.org/hfdappendices. Appendix A provides a detailed overview of the model, and Appendix B presents a description of the relationship between the different model sectors and dietary guidelines. Detailed descriptions of the scenarios and of our simulation are given in Appendices C and D, respectively.

Findings

Finding #1: If Americans ate fruits and vegetables at recommended levels, U.S. farmers would grow a lot more of these foods. We consider a scenario

that models a hypothetical 173 percent increase in overall U.S. demand for fruits, vegetables, and nuts (F&V), which we refer to as our F&V scenario. By our calculations, this is the percentage by which consumption of fresh fruits, vegetables, and nuts would need to increase in order for Americans to meet MyPlate dietary recommendations.² Such an increase in consumer demand would have the following impacts, as shown in Table 2 (p. 6):

- Production of F&V on U.S. farms would increase by 88 percent.
- U.S. farm acreage devoted to F&V would increase by 50 percent, from 10.7 million acres to 16.1 million acres.



Source (bottom graphic): © 2011, Harvard University. For more information about The Healthy Eating Plate, please see The Nutrition Source, Department of Nutrition, Harvard School of Public Health, www.thenutritionsource.org, and Harvard Health Publications, health.harvard.edu.

Imports and trade flows would also be affected if Americans ate fruits and vegetables at federally recommended levels. Fruits and vegetables are heavily traded on a global scale, and because some countries have longer growing seasons and other comparative advantages, a significant share of fruits and vegetables consumed in the United States is imported. In 2009, 39 percent of the

fruits and nuts consumed domestically came from other countries, while vegetable imports accounted for 18 percent of total U.S. vegetable consumption (USDA ERS 2013).

Our analysis indicates that in addition to the 88 percent increase in domestic F&V production under this dietary scenario, imports of F&V would increase by 120 percent. To meet the U.S. demand for imports, production of F&V would increase by 26 percent in NAFTA countries (Canada and Mexico), 15 percent in banana-exporting equatorial countries, 10 percent in southern hemisphere countries, and 2 percent in the rest of the world. (A more detailed description of these regions is available online in Appendix G.) It is important to note that while this increased U.S. demand for F&V could generate positive benefits for farmers in the developing world, it could also trigger higher F&V prices for consumers in those countries. Policy supports such as food stamps/vouchers, price subsidies, school food programs, and reduced consumption taxes would be needed in those countries to assist in such circumstances.

Table 2. Results for “F&V” (Scenario 1)

	United States	NAFTA Countries	Equatorial Countries	Southern Hemisphere Countries	Other Countries
% Change in F&V Production	88%	26%	15%	10%	2%
% Change in F&V Crop Acreage	50%	15%	8%	6%	0%
% Change in F&V Unskilled Labor	121%	31%	19%	12%	2%
% Change in F&V Skilled Labor	121%	31%	18%	12%	2%
% Change in F&V Capital	121%	31%	18%	12%	2%
Initial F&V Acreage (million acres)	10.7	16.3	6.8	37.6	497.6
Change in F&V Acreage (million acres)	5.4	2.4	0.5	2.1	-0.3

Table 3. Results for “Harvard Dairy” (Scenario 2) and “MyPlate Dairy” (Scenario 3)

	“Harvard Dairy”	“MyPlate Dairy”
% Change in U.S. Production of Final Product		
Dairy	-21%	63%
% Change in U.S. Production of Intermediate Product		
Milk	-16%	49%
U.S. Crop Production Changes		
% Change in Cereal Grain Production	-3%	9%
% Change in Cereal Grain Acreage	-2%	5%
Initial Cereal Grain Acreage (million acres)	104.8	104.8
Change in Cereal Grain Acreage (million acres)	-1.9	5.0

Finding #2: Changes in demand for dairy products—either up or down—would have implications for how much grain U.S. farmers grow. We analyzed the farmland impacts of alternate diet scenarios on the consumption of dairy products, which include milk and cheese. Under the “Harvard Dairy” scenario, we considered a 33 percent reduction in the consumption of dairy products, and in the “MyPlate Dairy” scenario we considered a 100 percent increase. Our findings, which we present in Table 3, were that:

- U.S. dairy production would decrease by 21 percent if Americans consumed dairy products according to the Harvard scenario, while dairy production would increase by 63 percent under the MyPlate scenario.
- U.S. cereal grain production would decrease by 3 percent in the Harvard scenario and increase by 9 percent in the MyPlate scenario. Cereal grain acreage would decrease by 2 percent in the Harvard scenario (1.9 million acres) but

Table 4. Results for “Harvard Protein” (Scenario 4) and “MyPlate Protein” (Scenario 5)

	“Harvard Protein”	“MyPlate Protein”
% Change in U.S. Production of Final Product		
Beef	-54%	-38%
Chicken	5%	-30%
% Change in U.S. Production of Intermediate Product		
Cattle	-49%	-36%
Poultry	2%	-25%
U.S. Crop Production Changes		
% Change in Cereal Grain Production	-10%	-8%
% Change in Cereal Grain Acreage	-5%	-5%
Initial Cereal Grain Acreage (million acres)	104.8	104.8
Change in Cereal Grain Acreage (million acres)	-5.7	-5.3

increase by 5 percent in the MyPlate scenario (5 million acres).

Finding #3: Changes in consumer demand for meat would similarly shift U.S. grain production. Here we considered the impacts of healthier protein consumption scenarios—the “Harvard Protein” and “MyPlate Protein” scenarios—and the results are shown in Table 4. We found that:

- Under the Harvard Protein scenario, U.S. beef production would fall by 54 percent while U.S. chicken production would increase by 5 percent.
- Under the MyPlate Protein scenario, beef production would decline by 38 percent and chicken production would decline by 30 percent.
- U.S. cereal grain production (including corn) would decrease by 10 percent in the Harvard Protein scenario and by 8 percent in the MyPlate Protein scenario. This would lead to a decrease of cereal grain acreage by 5.7 million acres in the Harvard Protein scenario and by 5.3 million acres in the MyPlate Protein scenario.

Results from additional scenarios are presented online in Appendix E and Appendix F, while Appendix H provides a comparison of our results with prior studies.

Potential Benefits of a Healthy Farm Landscape

A more diversified farm landscape in the United States—particularly in regions, such as the Midwest, that are now dominated by corn and soybean production—would likely generate a variety of societal benefits. Specifically, shifting some of the land now used for these two crops into fruit and vegetable production for local or regional sale and consumption would have benefits for nutrition, the environment, jobs, and farmers’ incomes. Producing less meat would have environmental payoffs as well.

Health and nutritional benefits. In recent decades, the United States has experienced an unprecedented epidemic of preventable diet-related chronic diseases and a concomitant explosion of associated medical costs. Healthier dietary regimens would increase the longevity and quality of life for those suffering from such diseases, as well as contribute to large public savings in entitlement programs such as Medicare and Medicaid. For example, a recent UCS report evaluated the link between fruit and vegetable consumption and incidence of cardiovascular disease—the leading killer of Americans today. Our analysis found that if Americans consumed just one additional serving of fruits or vegetables each day, we would prevent 30,000 deaths from coronary heart disease and stroke annually and save \$5 billion in national health care expenditures; if Americans went a step further and ate enough fruits and vegetables to fully meet federal dietary guidelines, we would prevent 127,000 such deaths each year and save \$17 billion in medical costs. Moreover, those 127,000 lives saved from these diseases would translate into economic values totaling an astonishing \$11 trillion (O’Hara 2013).



If Americans ate less meat, and more of this meat came from grass-fed livestock (like these cattle in southern Iowa), the resulting agricultural system would produce less corn, generate less pollution, and provide more nutritious food for consumers.

Shifting land into fruit and vegetable production in the Midwest and other agricultural regions could help achieve such health benefits by boosting the supply of these foods in local markets. Because shorter supply chains—such as direct farm-to-consumer sales—require minimal processing, they are an advantageous way to distribute fresh produce. Research also shows that compared with supermarkets, local food markets promote increased consumption of fresh fruits and vegetables (Freedman et al. 2013; Evans et al. 2012; Herman et al. 2008; Anderson et al. 2001). Even now, fruits, vegetables, and nuts constitute 65 percent of local food sales (Low and Vogel 2011). These facts suggest that bolstering local markets would help improve nutrition and thus lead to better health outcomes.

Environmental benefits. The present farming situation, in which corn and soybeans dominate the landscape of the nation’s agricultural heartland in monocultures or near-monocultures, has a variety of environmental consequences. Monocrop systems are ideal incubators for pest and weed proliferation, which in turn necessitates extensive use of toxic insecticides and herbicides. Monocropping also reduces soil fertility (UCS 2013). Corn in particular is a nutrient-hungry crop and requires intensive

application of fertilizer. The resulting runoff or leaching of fertilizer into streams and rivers leads to fish-killing “dead zones,” localized drinking water pollution, and emissions of nitrous oxide—a heat-trapping gas with a large global warming potential (Gurian-Sherman 2011; UCS 2011).

Today’s excess consumption of meat also has environmental implications. U.S. livestock production is increasingly taking place in large and crowded CAFOs (confined animal-feeding operations), which rely on heavy use of antibiotics (thereby reducing their effectiveness for human medical treatment), cause significant air and water pollution, and through their foul odors reduce the quality of life and property values in nearby neighborhoods (Gurian-Sherman 2008). Beef production in particular is a significant source of global warming emissions: cattle require large areas of pasture to feed and grow, and clearing land to develop pasture for beef production is a driver of deforestation in some countries—another contributor to global climate change (Boucher et al. 2012; Boucher et al. 2011). Moreover, beef and dairy cows emit significant amounts of methane—itsself a potent global warming gas (Gurian-Sherman 2011).

A farm landscape that included less corn and less meat production would avoid some of these negative environmental impacts.

Local economic benefits. Numerous studies have indicated that a shift to healthier diets could provide important economic opportunities for farmers, including those that sell “locally” through shorter supply chains (Tootelian, Mikhailitchenko, and Varshney 2012; Conner et al. 2008; Rickard and Gonsalves 2008; Cantrell et al. 2006). One recent study specifically estimated the economic impacts if farmers in six Midwestern states—Illinois, Indiana, Iowa, Michigan, Minnesota, and Wisconsin—shifted some of their corn and soybean cropland to seasonal production of fresh fruits and vegetables. Evaluating a scenario in which farmers within each state satisfied its in-season consumer demand for fresh produce, the research-

ers found that such a shift would generate 6,724 new jobs and \$336 million in additional income for farmers. This fruit and vegetable production resulted in a 6.7-fold increase in labor income and a 3.6-fold increase in jobs, compared with an equivalent acreage of cropland in corn and soybean production (Swenson 2010).

Local food systems also have an economic ripple effect. Farmers who sell locally are more likely to purchase intermediate inputs and equipment from local companies and hire local labor, spurring further economic development in the region (Schmit, Jablonksi, and Mansury 2013). In addition, local foods can provide market access and business opportunities that enable new farmers to get started. Given the aging of U.S. farmers—their average age in 2007 was 57 (USDA NASS 2009)—and the high fixed costs associated with acquiring land and machinery, selling locally will be an important way to get a new generation into the business of farming. Moreover, selling locally can help foster entrepreneurship among farmers and enable their development of business skills that increase their chances of success (Feenstra et al. 2003; Lyson, Gillespie, and Hilchey 1995).

Conclusions and Recommendations

Dedicating more agricultural land across the United States to healthy food production would further the expansion of local and regional food systems, which have already seen rapid growth in recent years. For example, there has been a remarkable increase in the number of U.S. farmers' markets, from 340 in 1970 to 8,144 in 2013 (USDA AMS 2013; Brown 2001); and the number of farm-to-school programs has grown from six in 2001 to more than 10,000 today (National Farm to School Network 2013). As our analysis suggests, the United States has the potential to further diversify its farming systems to produce the variety of healthy foods its people need.

One study found that if farmers in six Midwestern states shifted some of their cropland to fruits and vegetables, it would generate 6,724 new jobs and \$336 million in additional income.

Transitioning from the current U.S. farm landscape to one that produced this healthy mix would have potential benefits not just for public health and nutrition; the shift would also reduce agriculture's environmental footprint and provide new opportunities for American farmers and farm communities. Such a transition could set the stage for a new era of prosperity built around produce-heavy regional food systems and fewer but more efficient livestock-production systems generating higher-quality meat.

This goal of aligning U.S. agricultural production with healthy eating habits can be attained with targeted, smart, and relatively low-cost farm-policy investments that rectify shortcomings along the U.S. fruit and vegetable supply chain. Reshaping farm policy for this purpose has considerable public support—84 percent of U.S. adults endorse government policies that improve the affordability of fruits and vegetables (Morain and Mello 2013).



The Michigan farms pictured here incorporate a mix of orchards and field crops. Similarly diverse farm landscapes across the U.S. Midwest would produce environmental and rural economic benefits.

The goal of aligning U.S. agricultural production with healthy eating habits can be attained with targeted, smart, and relatively low-cost farm-policy investments.

Our recommendations for spurring this transition are straightforward:

Congress should fund, and the USDA should implement, programs that help farmers grow more fruits and vegetables. There are several ways this can be accomplished:

- Remove fruit and vegetable planting restrictions from federal commodity subsidy programs that disqualify farmers for growing these healthy foods.
- Develop effective crop insurance programs geared for diversified farms—particularly those growing a variety of fruits and vegetables—to help those establishments' farmers manage their risks and induce them to sell in local markets (O'Hara 2012).

- Invest in publicly funded research aimed at producing higher-yielding fruit and vegetable crops, generating new varieties and adapting them to local conditions, and rendering fruits and vegetables more resilient to adverse weather events and other farming challenges.

Congress and the USDA should also fund and implement policies to improve consumer access to fruits and vegetables. In particular, they should:

- Bolster programs that provide grants and loans to help build market infrastructure such as food retailers, farmers' markets, and food hubs.
- Reduce obstacles facing consumers who wish to redeem nutrition-assistance benefits at local food markets. One way to do this is to provide matching financial incentives for those hoping to use their benefits when buying food directly from farmers.

Congress should curb subsidies that promote production of ingredients for unhealthy processed food and instead make modest but increased investments in programs, such as those listed above, that help farmers grow the foods Americans need.



Public policies that encourage and enable more farmers across the country to grow fruits and vegetables would benefit farmers, consumers, and the environment.



Endnotes

¹ We used a model developed by the Global Trade Analysis Project (GTAP), based at Purdue University.

² Like MyPlate, the Harvard Healthy Eating Plate guidelines encourage increased consumption of fruits and vegetables. However, unlike MyPlate, the Harvard guidelines recommend limited consumption of potatoes. Because of the difficulty of separating potatoes from other F&V in our model, we did not simulate a specific increase in F&V consumption that would meet the Healthy Eating Plate guidelines.

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