Teacher print kit

Food Up!

An Urban Agriculture Curriculum

Table of Contents

pdf page #

3 . . . . Module 1: Winning Us Over: Food Marketing and Food Choice

14 . . . . Module 2: Our Food System: From Farm to Table

27 . . . . Module 3: How to Feed A Plant: What a Plant Needs to Grow

31 . . . . Module 4: Food Desert to Food Oasis: Food Security and Urban Farming

41 . . . . Module 5: Make it Last: Sustainable Agriculture and Agroecology

52 . . . . Module 6: Animals in Agriculture (*optional)*

54 . . . . Module 7: Climate Change and Food: Why a Changing Climate Matters to You

68 . . . . Module 9: The Value Within Our Food

WINNING US OVER: FOOD MARKETING AND FOOD CHOICE

Module 1
Teacher Print Kit

Instructions: Print one copy of this document as a reference *for the Teacher.* You can print double- or single-sided. Additionally, print the Student Handouts for Module 1.

Food Up!

Optional Teacher Background Reading

The Impact of Food Advertising on Childhood Obesity
The American Psychological Association

"The childhood obesity epidemic is a serious public health problem that increases morbidity, mortality, and has substantial long term economic and social costs. The rates of obesity in America's children and youth have almost tripled in the last quarter century. Approximately 20% of our youth are now overweight with obesity rates in preschool age children increasing at alarming speed. According to the Centers for Disease Control and Prevention, the prevalence of obesity has more than doubled among children ages 2 to 5 (5.0% to 12.4%) and ages 6 to 11 (6.5% to 17.0%). In teens ages 12 to 19, prevalence rates have tripled (5.0% to 17.6%). Obesity in childhood places children and youth at risk for becoming obese as adults and associated poor health such as diabetes, cardiovascular disease, and some forms of cancer. Prevention efforts must focus on reducing excess weight gain as children grow up.

Today's children, ages 8 to 18, consume multiple types of media (often simultaneously) and spend more time (44.5 hours per week) in front of computer, television, and game screens than any other activity in their lives except sleeping. Research has found strong associations between increases in advertising for non-nutritious foods and rates of childhood obesity."

Optional Teacher Background Continued...

“Most children under age 6 cannot distinguish between programming and advertising and children under age 8 do not understand the persuasive intent of advertising. Advertising directed at children this young is by its very nature exploitative. Children have a remarkable ability to recall content from the ads to which they have been exposed. Product preference has been shown to occur with as little as a single commercial exposure and to strengthen with repeated exposures. Product preferences affect children's product purchase requests and these requests influence parents' purchasing decisions.”

References:

1. The American Psychological Association, 2010. The Impact of Food Advertising on Childhood Obesity

Activity #1: Brand Recognition

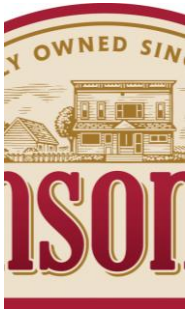
Answer Key for Teachers

A. Gatorade
B. Pepsi
C. Mountain Dew
D. Starbucks
E. Kit Kat
F. Gerber
G. McDonalds
H. Subway
I. Johnsonville Sausages
J. KFC
K. Organic Valley
L. Kraft
M. Heinz
N. Green Giant
O. Up and Up
P. Great Value
Q. Market Pantry
R. Kwik Trip
S. Roundys
T. Aldis

Activity #1: Brand Recognition Images

Logos A-H

A 	B 	C 	D 
E 	F 	G 	H 

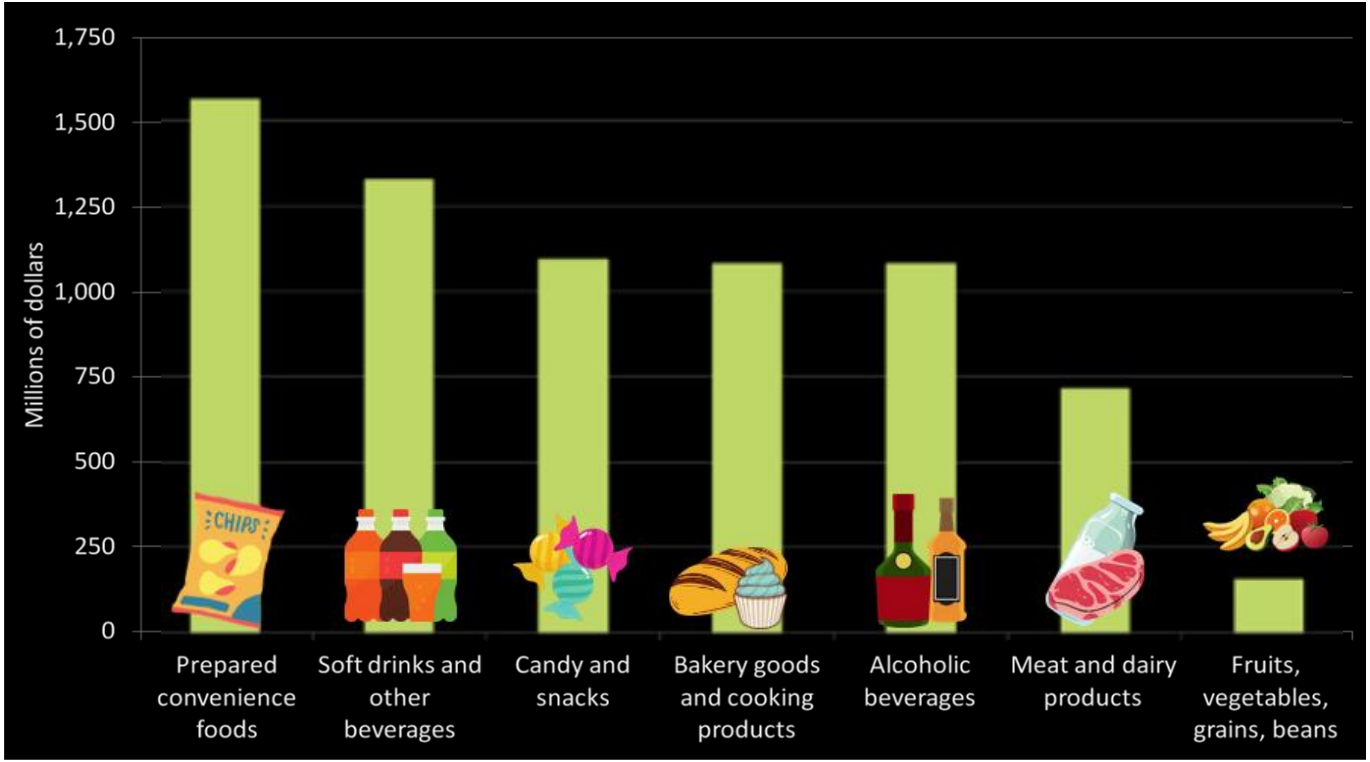
I 	J 	K 	L 
Heinz M 	N 	O 	P 
Q 	R 	S 	T 

ACTIVITY #2: INVESTIGATING THE AD DOLLAR

Show your students the following graphics as you would through this activity.

1. US Food Advertising Spending
2. Fast Food Advertising Graphic
3. Hours of Fast-Food Ads Per Year Watched by Children

US Food Advertising Spending

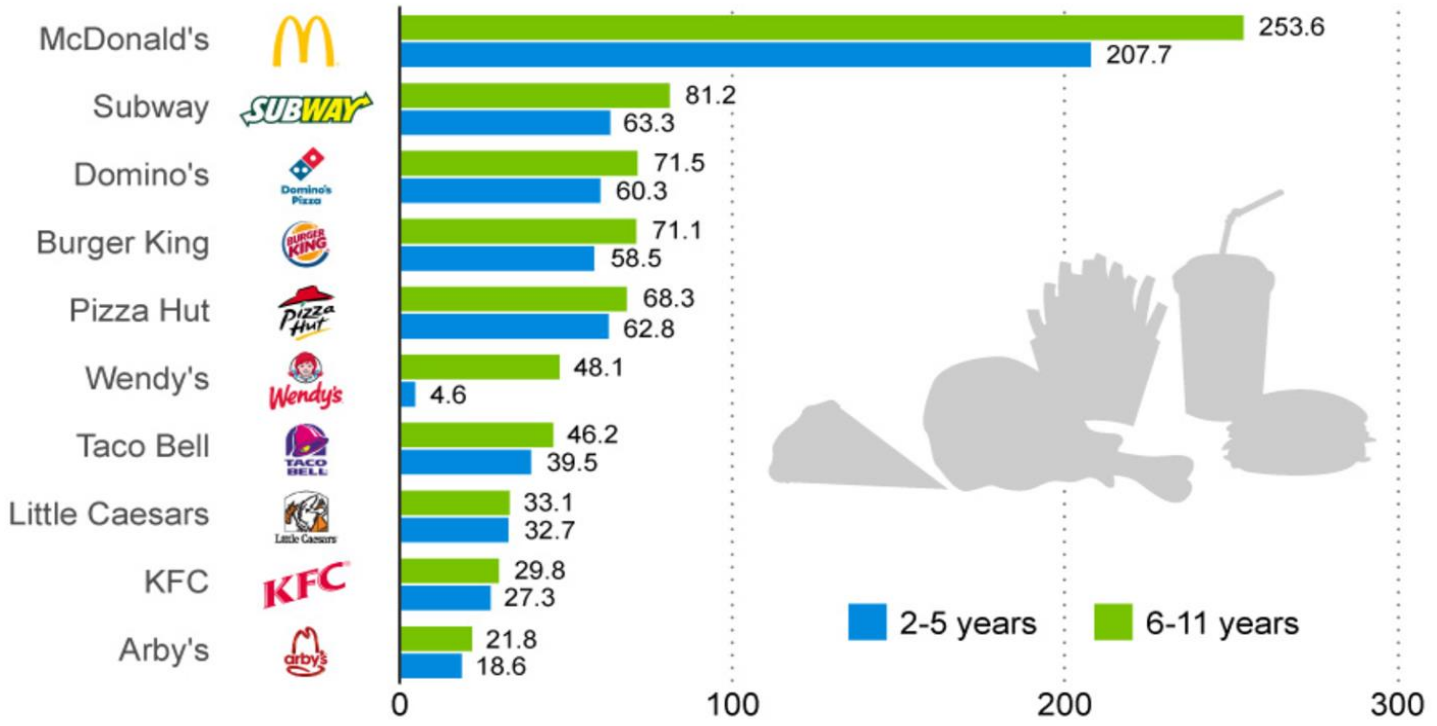


Annual spending by U.S. food and beverage manufacturers on advertising in 1997 (the last year industry-wide data were openly available); Source: Gallo A. Food Advertising in the United States. In: America's Eating Habits Changes and Consequences. USDA Economic Research Service; 1999:173-180. Image Adapted from Foodspan.

Source: Yale Rudd Center for Food Policy & Obesity, as shown in *The Media Does Not Have My Mind* by Soul Fire Farm

U.S. Kids Watch Hundreds of Fast Food Ads Per Year

Fast food brands most advertised to U.S. children aged 2-11 (average # of ads viewed in 2012)



Source: Nielsen, Yale Rudd Center for Food Policy, as shown in *The Media Does Not Have My Mind* by Soul Fire Farm

Activity #3: Strategy Sleuths

Discussion Questions:

- Who is this ad intended for?

- What strategies are the advertisers using to appeal to their audience?

- How effective do you think the ad is in selling the product?

Our Food System–From Farm to Table

Module 2
Teacher Print Kit

Instructions: Print one copy of this document as a reference *for the Teacher.* It is easiest to print **double-sided, on the short-edge.** Additionally, print the Student Handouts for Module 2.

Food Up!

Activity #1 and Activity #4 : Food Dollar Infographic

It will be helpful to look over this infographic before teaching Activity #1, as it gives context to why some foods have a larger farmer share of the retail dollar than others.

When students imagine themselves as farmers in Activity #4, they will use the following infographic to come up with original ways to keep more of the retail dollar in their pocket. Encourage your students to imagine value added products that allow them to create something more valuable out of a low value field crop.

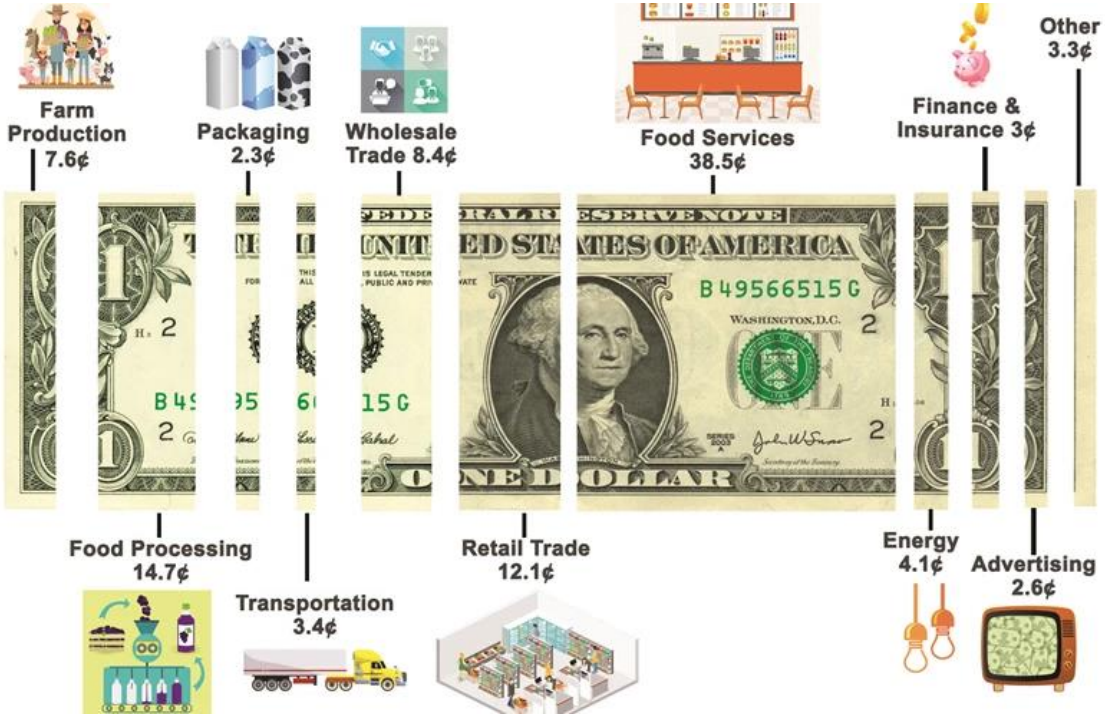


Image illustrates how much of the average dollar spent on food in the United States goes to each part of the food supply chain. Notice that farmers and ranchers only get 7.6 cents of the average food dollar. Source: US Department of Agriculture 2019

Activity #1: Where Does Your Dollar Go?
Optional Discussion Activity

CARROTS

SODA

Calculate how much money participants along the food chain, besides farmers, receive from a dollar spent for both carrots and soda.

Who else gets some of this money?
Why might the farmer's share be larger for carrots than it is for soda?

ACTIVITY #2: FOOD CHAIN INFOGRAPHIC

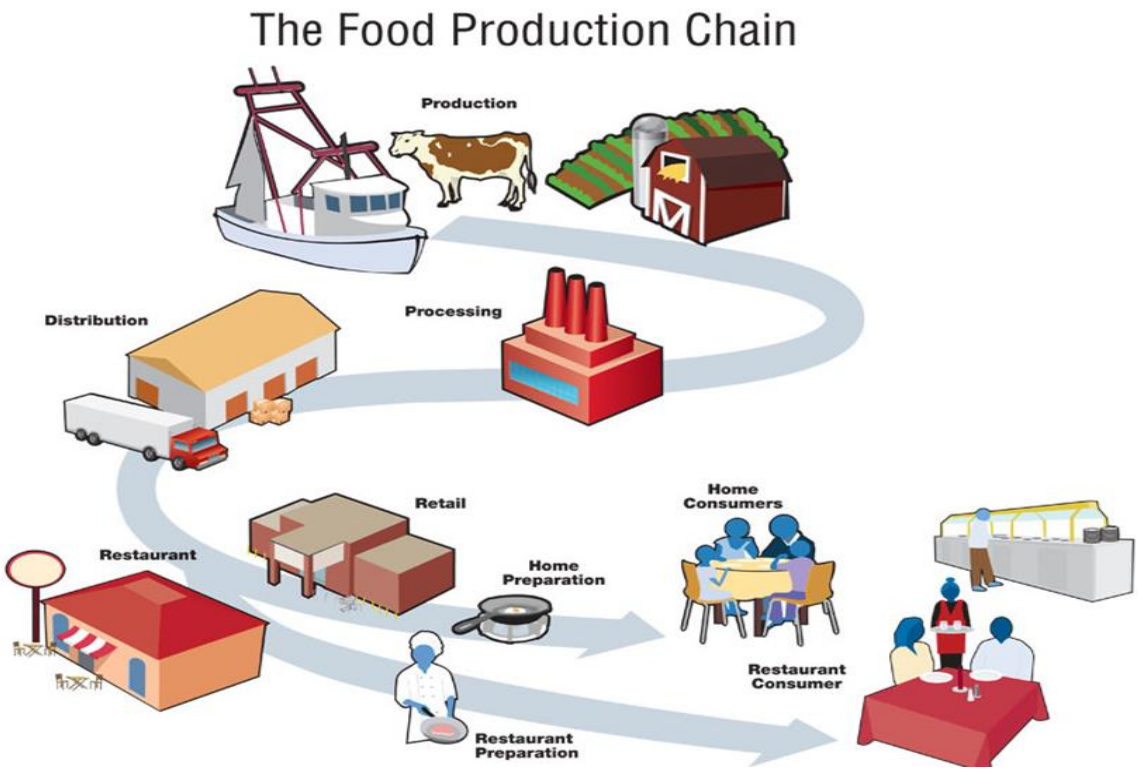


Image Source: Centers for Disease Control and Prevention, 2013 (https://www.cdc.gov/foodsafety/outbreaks/investigating-outbreaks/figure_food_production.html).

Activity #2: Food Production Chain Teacher Cards

Production: How the Food is grown

Distribution: How the product moved from the farm to the eater

Processing: Changing the crop into what is eaten

Consumption: The use of the product by the end Consumer

Distribution

- Trucking
- Marketing and Advertising
- People who build trucks, planes
- Energy workers
- Highway builders
- Food hubs

Production

- Tractor Manufacturers
- Fertilizer manufacturers
- Well diggers
- Farmers
- Construction workers
- Natural gas, petroleum, electricity, solar power manufacturers

Consumption

- Restaurants
- Grocery stores
- Farmers Markets
- Home

Processing

- Honey and maple syrup bottling
- Washing and bagging/banding/boxing produce
- Butchering
- Canning
- Processing Corn into Corn Syrup and Corn Flakes
- Freezing
- Plastic Production for packaging
- Cooking food in our kitchens and restaurants

Waste Management

Collection, transport, treatment, and disposal of waste






Waste Management

- Sewage after human consumption
- Compost of food scraps
- Trash/Landfill
- Recycling of packaging
- Management of manure
  - Spreading on fields
  - Storing in pits
  - Leaking into waterways

Activity #3: The Journey Answer Key

Note to teacher: Steps bolded below have variable positions in the food value chain.

Cheese

1. Corn and soy are harvested from the field for animal feed
2. Calves are born; cows do not produce milk until a baby calf is born
3. **Milking equipment, including pumps and tanks, are manufactured (this fits anywhere before step four)**
4. Cows are milked.
5. Milk is pasteurized to kill bacteria
6. Milk truck comes to transport milk to the cheese plant
7. Cultures are added to the milk, and whey is squeezed out of the milk
8. Cheese is packed in wax or plastic
9. Cheese is graded by the USDA
10. Cheese is retailed in the grocery store
11. Macaroni and cheese is enjoyed on your dinner table
12. **Manure is spread on fields (can be moved to the beginning or the end)**

Soda

1. **Glass bottles or cans are recycled or sent to the landfill**
2. **Soda cans are made from recycled aluminum**
3. Corn, cane, or beets are planted
4. Corn, cane, or beets are harvested
5. Corn, cane, or beets are washed, packed, and transported to syrup factory
6. Sugar syrup is manufactured
7. **Flavor development and testing is done in the lab**
8. Water is filtered
9. Water and syrup are combined and sent through a carbonator
10. Soda is canned or bottled
11. **Marketers design labels, magazine ads, and television ads**
12. Soda is distributed to grocery stores, restaurants, event venues, and vending machines

Carrots

1. Carrots are bred for seeds that have good harvests, are resistant to disease, and have great flavor
2. Potash is mined to make potassium rich fertilizer
3. Tractor plants carrot seeds in rows
4. Carrots are harvested by a tractor or by hand
5. Carrots are washed and graded
6. Carrots are transported from the farm to their destination
7. Carrots are sold at the farmers market
8. Plastic bags are manufactured for frozen carrot packaging
9. Carrots are chopped and flash frozen in a factory
10. Carrots are canned in a factory
11. Carrots are shipped to a distributor
12. Grocery stores order carrots from distributor

Activity #4: Value Added Product Examples

Milk 	→	Cheese 
Wheat 	→	Pasta 
Carrots, Onion, Parsley   	→	Canned Soup 
Sugar Beets 	→	Fruit Snacks 
Grapes 	→	Grape Juice 

Activity #4: George Washington Carver

You may choose to watch this biography to get context on George Washington Carver, or show the video in class: https://www.youtube.com/watch?v=sdz8XTNttdc

Activity #4: Teacher Background: George Washing Carver, A Short Biography

George Washington Carver (~1861 - 1943) was an agricultural chemist and agronomist passionate about the success of black farmers in the south in the early years after the Civil War.

During the Civil War, infant George and his mother Mary were kidnapped. Their owner, Moses Carver, hired a neighbor to find them. The neighbor found baby George, but never found George's mother. George and his brother were adopted after the war by his former owners Moses and Susan Carver. George was not accepted into schools in the area due the color of his skin, so Susan taught George and his brother to read and write as children.

George left the Carvers at age eleven to further pursue education. He earned his high school education, and later his Bachelor of Science in Agricultural Science from Iowa State University in 1892. In 1896, he was hired as Director of Agricultural Research at Tuskegee University under Booker T. Washington.

(continued on next page…)

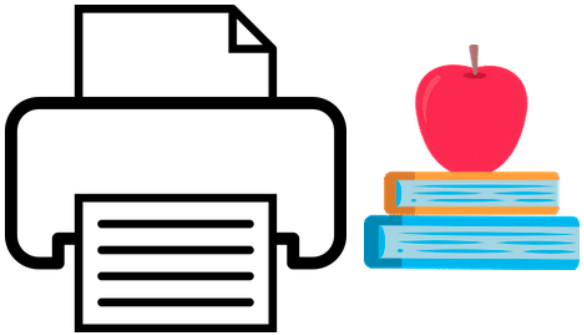
Activity #4: Teacher Background: George Washing Carver, A Short Biography

Carver grew familiar with the south's dependence on cotton. As an agronomist, he saw the toll that cotton was taking on the soils, as cotton is a heavy feeder of nutrients. He encouraged the use of peanuts and other legumes to fertilize the soil and ensure sustainability of the soil on black land in the south. In an effort to bring more value to the crops that black farmers were growing, Carver invented over 100 value added products for the sweet potato, and over 300 for the peanut. Due in large part to his efforts, in the fifty years after Carver's start at Tuskegee, peanuts went from an unrecognized crop to one of the top six leading crops in the south. His inventions for the use of peanuts included milk, flour, ink, plastic, wood stain, linoleum, medicinals, and cosmetics.

In the face of severe oppression toward black share croppers in the post-slavery south, Carver dedicated his life to the economic advancement of black farmers in the south. Despite job offers from those such as Henry Ford and Thomas Edison, Carver never left Tuskegee due to a deep dedication to the black southern farmer. When he died, he left his life savings to found the George Washington Carver Institute for Agriculture at Tuskegee to continue his work.

How to Feed a Plant: What a Plant Needs to Grow

Module 3
Teacher Print Kit



Instructions: Print one copy of this document as a reference *for the Teacher.* It is easiest to print this document **double-sided, on the short-edge.** Additionally, print the Student Handouts for Module 3.

Food Up!

Activity #1: Plant Climate map answer key

Crop	Climate
Corn	Temperate
Wheat	Temperate
Pineapple	Tropical
Banana	Tropical
Watermelon	Arid
Date	Arid
Kale	Polar
Highbush Cranberries	Polar
Grapes	Mediterranean

Activity #1: Teacher Cards – Front

Nutrients & Soil

Water

Sunlight

Air

Activity #1: Teacher Cards - Back

Water

Water is used to carry nutrients from the soil to other parts of the plant. It is used to create energy during photosynthesis, and to store energy in fruits and leaves.

Soil and Nutrients

Plants need nitrogen, potassium, and phosphorous to transport nutrients, create energy through photosynthesis, and store energy. These nutrients are available in the soil and are taken up through the root of a plant.

Soil also stores water to be taken up by roots. A plant strongly rooted in the soil is less susceptible to being pulled up by strong winds.

Air

Air provides oxygen, hydrogen, and carbon. These elements are used to store energy from the sun. The sun's energy is transformed into glucose in a plants' leaves during photosynthesis.

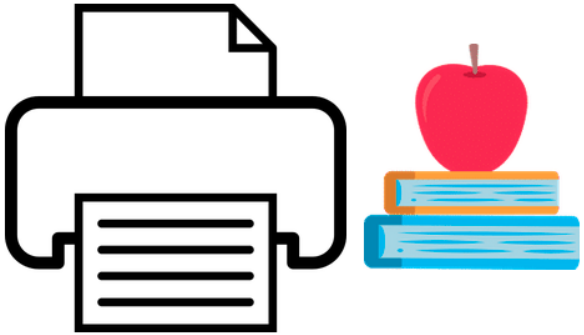
Humidity in the air can help store heat from the sun, making the environment easier for plants to grow in.

Sunlight

Sunlight provides the energy necessary to transform elements in the air into glucose energy through photosynthesis. It also provides the heat that plants need to facilitate water movement (and hence nutrient movement) in a plant.

Food Desert to Food Oasis: Food Security and Urban Farming

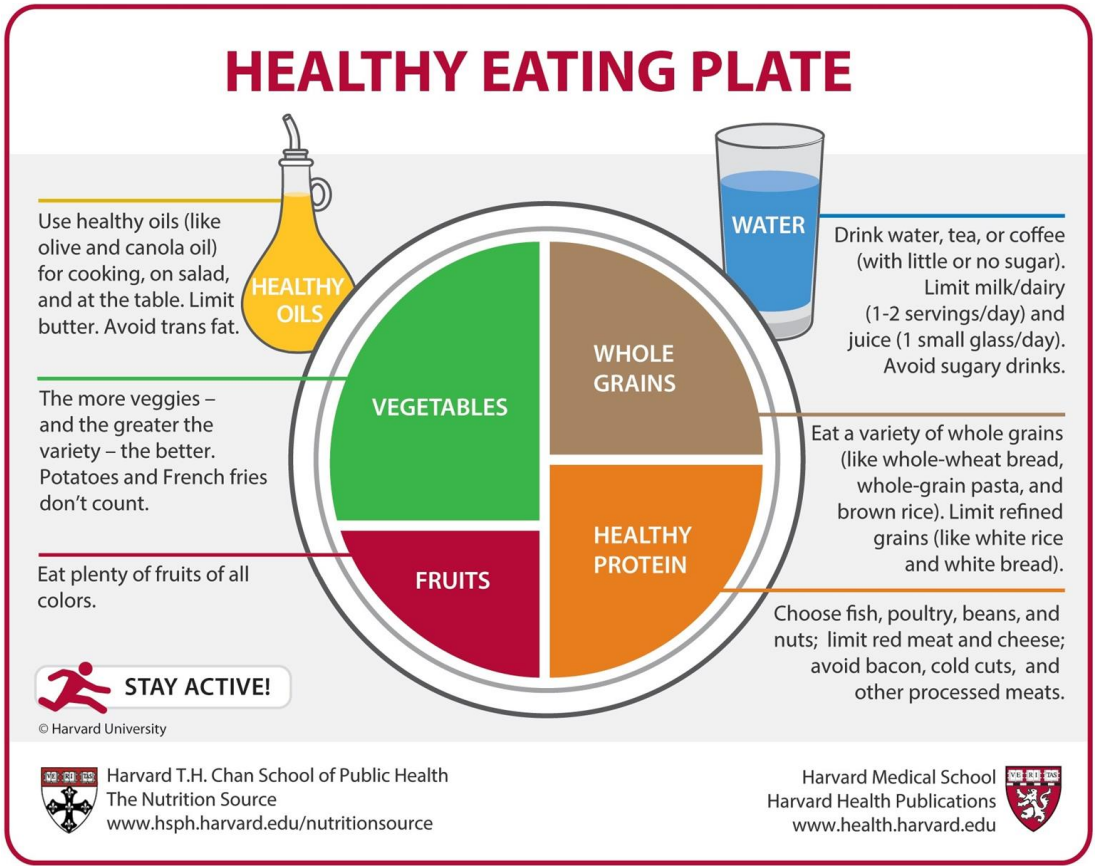
Module 4
Teacher Print Kit



Instructions: Print one copy of this document as a reference *for the Teacher.* You can print double- or single-sided. Additionally, print the Student Handouts for Module 1.

Food Up!

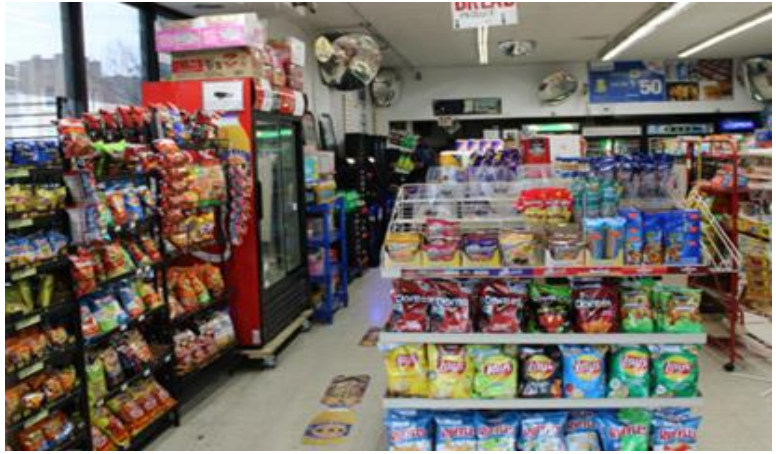
Activity #2


HEALTHY EATING PLATE
Use healthy oils (like olive and canola oil) for cooking, on salad, and at the table. Limit butter. Avoid trans fat.
HEALTHY OILS
The more veggies – and the greater the variety – the better. Potatoes and French fries don't count.
VEGETABLES
Eat plenty of fruits of all colors.
FRUITS
WHOLE GRAINS
HEALTHY PROTEIN
WATER
Drink water, tea, or coffee (with little or no sugar). Limit milk/dairy (1-2 servings/day) and juice (1 small glass/day). Avoid sugary drinks.
Eat a variety of whole grains (like whole-wheat bread, whole-grain pasta, and brown rice). Limit refined grains (like white rice and white bread).
Choose fish, poultry, beans, and nuts; limit red meat and cheese; avoid bacon, cold cuts, and other processed meats.
STAY ACTIVE!
© Harvard University
Harvard T.H. Chan School of Public Health
The Nutrition Source
www.hsph.harvard.edu/nutritionsource
Harvard Medical School
Harvard Health Publications
www.health.harvard.edu

Activity #2

Jadyn

Jadyn passes by a convenience store on her way to and from school. She goes with her friends to the convenience store a couple times a week to get a snack before yearbook club. A small farmer's market is hosted in her neighborhood on Wednesdays from 2-5 pm during the summer and fall. The nearest grocery store is 1.5 miles away. Her family does not own a car, but Jadyn has a free student bus pass. Jaden's mom grows a container garden on their apartment's porch every year. Jaden's family receives SNAP (formerly known as food stamp) benefits. Jadyn's school has a backpack food program, and Jadyn is able to take a pre-packed backpack full of healthy food home for free once every two weeks. Jadyn's mom works two jobs, and Jadyn is very involved with extra curriculars at school, so their time available to cook is limited.



Activity #2

Amari

Amari lives in the suburbs, so his nearest grocery store is 3 miles away. His access to public transportation is very limited. Amari, his mom, and his dad all have their own cars. Amari helps his dad grow a garden every year in their backyard. Amari's family is in the middle class, so they are able to afford most fresh produce and healthy food at the grocery store when they'd like it. Amari grew up with a family friend who regularly taught him to cook healthy food. Amari gets together with his neighbors once per month for a potluck.

Activity #2: Food Security Pyramid

Source: Adapted from the USDA Economic Research Service.

Activity #4: The Benefits of Urban Agriculture

Francey and the team at Mill City Grows are not alone in seeing a garden energize a neighborhood. Often led by and rooted in communities of color and immigrant and New American communities, urban gardens and farms bolster the well-being and resilience of our cities. Here's a look at the many benefits they provide:

Nutrition: Urban agriculture offers increased access to healthy, locally grown, and culturally appropriate food sources. Having space to grow and share food is especially important in disinvested and underserved neighborhoods, where finding affordable fruits and vegetables can be challenging. Plus, growing and eating food locally reduces the distance food travels to our plates – which is good for our climate and our health, as food loses nutritional value in transport.

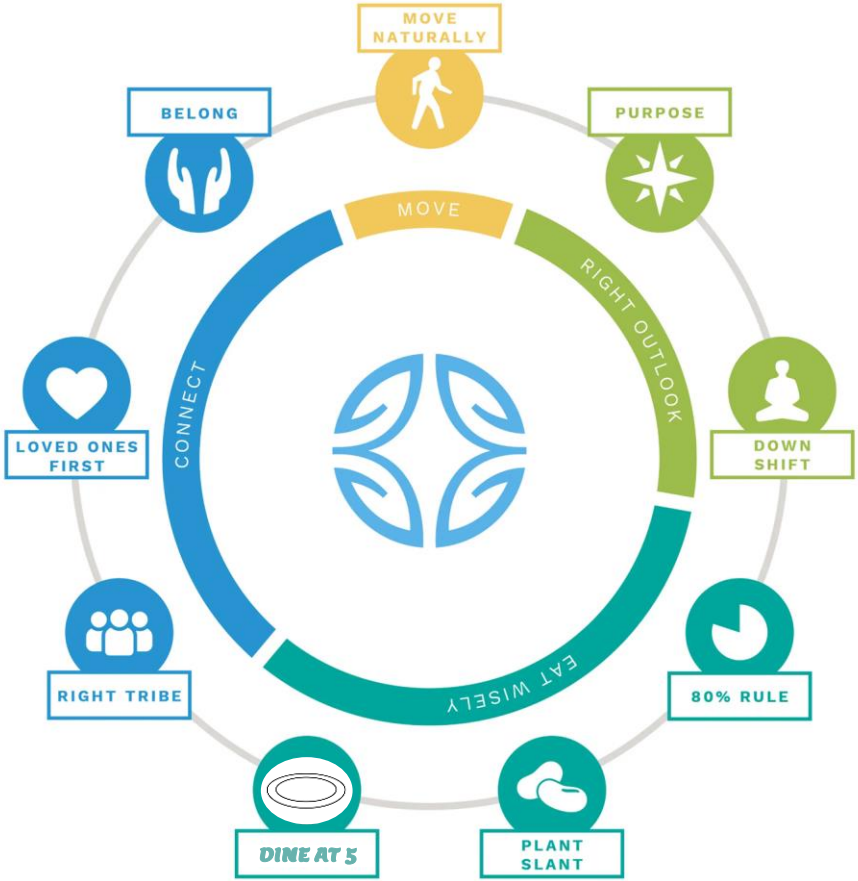
Health: While eating fresh food is beneficial in and of itself, the act of growing that food also boosts physical and mental health. Research shows that working with plants—and putting our hands in the dirt—provides outdoor physical activity, induces relaxation, and reduces stress, anxiety, blood pressure, and muscle tension.

Economy: Urban agriculture can provide a flexible source of income for gardeners and cut family food costs. Also, urban gardening and farming projects, like Mill City Grows, can often provide job training and jumpstart food entrepreneurship.

Community: Urban farming adds and preserves green space in cities, providing places for neighbors to come together, strengthen bonds, and build community cohesion. Urban agriculture connects people with the earth and the source of their food as well as with each other. What's more, urban farms offer critical opportunities for youth leadership, intergenerational collaboration, and cross-cultural learning.

Environment: Urban agriculture improves environmental health and climate resilience in the face of increasing storms and heat. Cultivated land absorbs rainfall, preventing stormwater from overloading sewer systems and polluting waterways. Also, by increasing vegetation and tree cover, farms and gardens attract pollinators like bees and keep city neighborhoods cooler, minimizing the health impacts of heat island effect.

Activity #4: Blue Zones Principles



Activity #4: Blue Zones Principles

1. Move Naturally:
   - *The world's longest-lived people don't pump iron, run marathons or join gyms. Instead, they live in environments that constantly nudge them into moving without thinking about it. They grow gardens and don't have mechanical conveniences for house and yard work.*
2. Purpose:
   - *The Okinawans call it "Ikigai" and the Nicoyans call it "plan de vida;" for both it translates to "why I wake up in the morning." Knowing your sense of purpose is worth up to seven years of extra life expectancy*
3. Down Shift:
   - *Even people in the Blue Zones experience stress. Stress leads to chronic inflammation, associated with every major age-related disease. What the world's longest-lived people have that we don't are routines to shed that stress. Okinawans take a few moments each day to remember their ancestors, Adventists pray, Ikarians take a nap and Sardinians do happy hour.*
4. 80% Rule:
   - *"Hara hachi bu" – the Okinawan, 2500-year-old Confucian mantra said before meals reminds them to stop eating when their stomachs are 80 percent full. The 20% gap between not being hungry and feeling full could be the difference between losing weight or gaining it. People in the blue zones eat their smallest meal in the late afternoon or early evening and then they don't eat any more the rest of the day.*
5. Plant Slant:
   - *Beans, including fava, black, soy and lentils, are the cornerstone of most centenarian diets. Meat—mostly pork—is eaten on average only five times per month. Serving sizes are 3-4 oz., about the size of a deck of cards.*

Activity #4: Blue Zones Principles

6. Wine @ 5:
   - *People in all blue zones (except Adventists) drink alcohol moderately and regularly. Moderate drinkers outlive non-drinkers. The trick is to drink 1-2 glasses per day (preferably Sardinian Cannonau wine), with friends and/or with food. And no, you can't save up all week and have 14 drinks on Saturday.*
7. Belong:
   - *The all but five of the 263 centenarians we interviewed belonged to some faith-based community. Denomination doesn't seem to matter. Research shows that attending faith-based services four times per month will add 4-14 years of life expectancy.*
8. Loved Ones First:
   - *Successful centenarians in the blue zones put their families first. This means keeping aging parents and grandparents nearby or in a home (It lowers disease and mortality rates of children in the home too). They commit to a life partner (which can add up to 3 years of life expectancy) and invest in their children with time and love (They'll be more likely to care for you when the time comes).*
9. Right Tribe:
   - *The world's longest-lived people chose – or were born into – social circles that supported healthy behaviors, Okinawans created "moais" – groups of five friends that committed to each other for life. Research from the Framingham Studies shows that smoking, obesity, happiness, and even loneliness are contagious. So, the social networks of long-lived people have favorably shaped their health behaviors.*

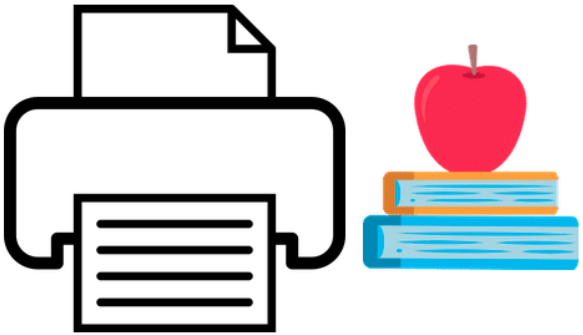
To make it to age 100, you would have to have won the genetic lottery. But most of us have the capacity to make it well into our early 90's and largely without chronic disease. As the Adventists demonstrate, the average person's life expectancy could increase by 10-12 years by adopting a Blue Zones lifestyle.

A note for teachers: Why the Healthy Eating Plate over MyPlate?

Linked here is context on why our team decided to teach from Harvard Medical School's Healthy Eating Plate, rather than the United States Department of Agriculture's MyPlate. In sum, the Healthy Eating Plate is based exclusively on the best available nutritional science. The USDA's nutrition resources are based not only on the interests of optimal human nutrition, but also the political and commercial interests of the food industry in the United States. For the purposes of this lesson, students will be considering optimal human nutrition when evaluating food security.

Make it Last: Sustainable Agriculture and Agroecology

Module 5
Teacher Print Kit



Instructions: Print one copy of this document as a reference *for the Teacher.* It is easiest to print this document **double-sided, on the short-edge.** Additionally, print the Student Handouts for Module 5.

Food Up!

Activity #1: Thriving Together — Defining Sustainability

"Sustainability means meeting our own needs without compromising the ability of future generations to meet their own needs. In addition to natural resources, we also need social and economic resources. Sustainability is not just environmentalism. Embedded in most definitions of sustainability we also find concerns for social equity and economic development." [1]

"Sustainability is the process of living within the limits of available physical, natural and social resources in ways that allow the living systems in which humans are embedded to thrive in perpetuity." [1]

Sustainability means the ability to continue over a period of time.[2]

Triple Bottom Line (Dalibozhko & Krakovetskaya, 2018)

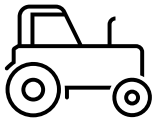
1. What is Sustainability? From the University of Alberta, Office of Sustainability. https://www.mcgill.ca/sustainability/files/sustainability/what-is-sustainability.pdf
2. Cambridge Dictionary. https://dictionary.cambridge.org/us/dictionary/english/sustainable

Sustainable Agriculture

As it pertains to agriculture, John Ikerd describes sustainable farming systems as those that are "capable of maintaining their productivity and usefulness to society indefinitely. Such systems... must be resource-conserving, socially supportive, commercially competitive, and environmentally sound."

The 1990 United State's Farm Bill defines sustainable agriculture as: "an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

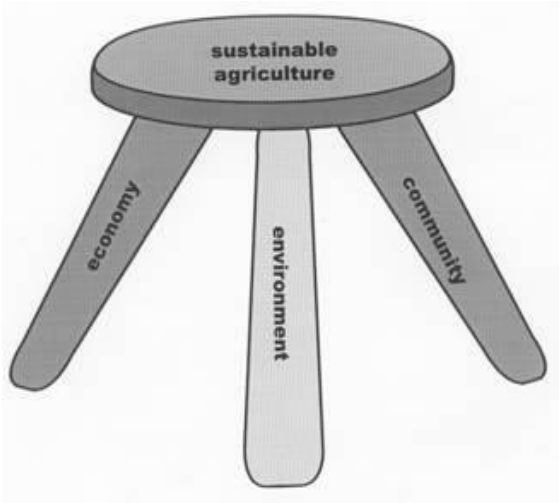
- Satisfy human food and fiber needs
- Enhance environmental quality and the natural resource base upon which the agricultural economy depends
- Make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls
- Sustain the economic viability of farm operations
- enhance the quality of life for farmers and society as a whole."



Source: John Ikerd, as quoted by Richard Duesterhaus in "Sustainability's Promise," Journal of Soil and Water Conservation (Jan.-Feb. 1990).
See also: USDA, 2007. https://www.nal.usda.gov/legacy/afsic/sustainable-agriculture-definitions-and-terms

Three Legs of Sustainability

Economy: Sustainable agriculture is *economically sustainable*. Agriculture should provide a secure living to farm families and others employed in food production and processing. An economically sustainable approach also provides access to good food for all people.



Environment: Sustainable agriculture is *environmentally sound*. It preserves the quality of basic natural resources that the farms, businesses and the surrounding environment rely on, including soil, water, and air. Agriculture affects natural resources. Cooperating with natural resource systems instead of trying to overpower them can offer benefits to food production as well as the natural environment .

Community: Sustainable agriculture is good for families and communities. It promotes opportunities and cooperative relationships for family and community members. For example, a local food marketing system called community supported agriculture (CSA) offers opportunities for people to get into farming without major capital investment; provides work for family members, including children, on the farm; and creates direct partnerships with consumers in the community.

Source: Adapted from Toward a Sustainable Agriculture Curriculum for Highschool Students, Module 1, Section A from the Center for Integrated Agricultural Systems at the University of Wisconsin-Madison. (https://cias.wisc.edu/curriculum-new/module-i/module-i-section-a/#intro)

Activity #2: Sustainable? You Decide!

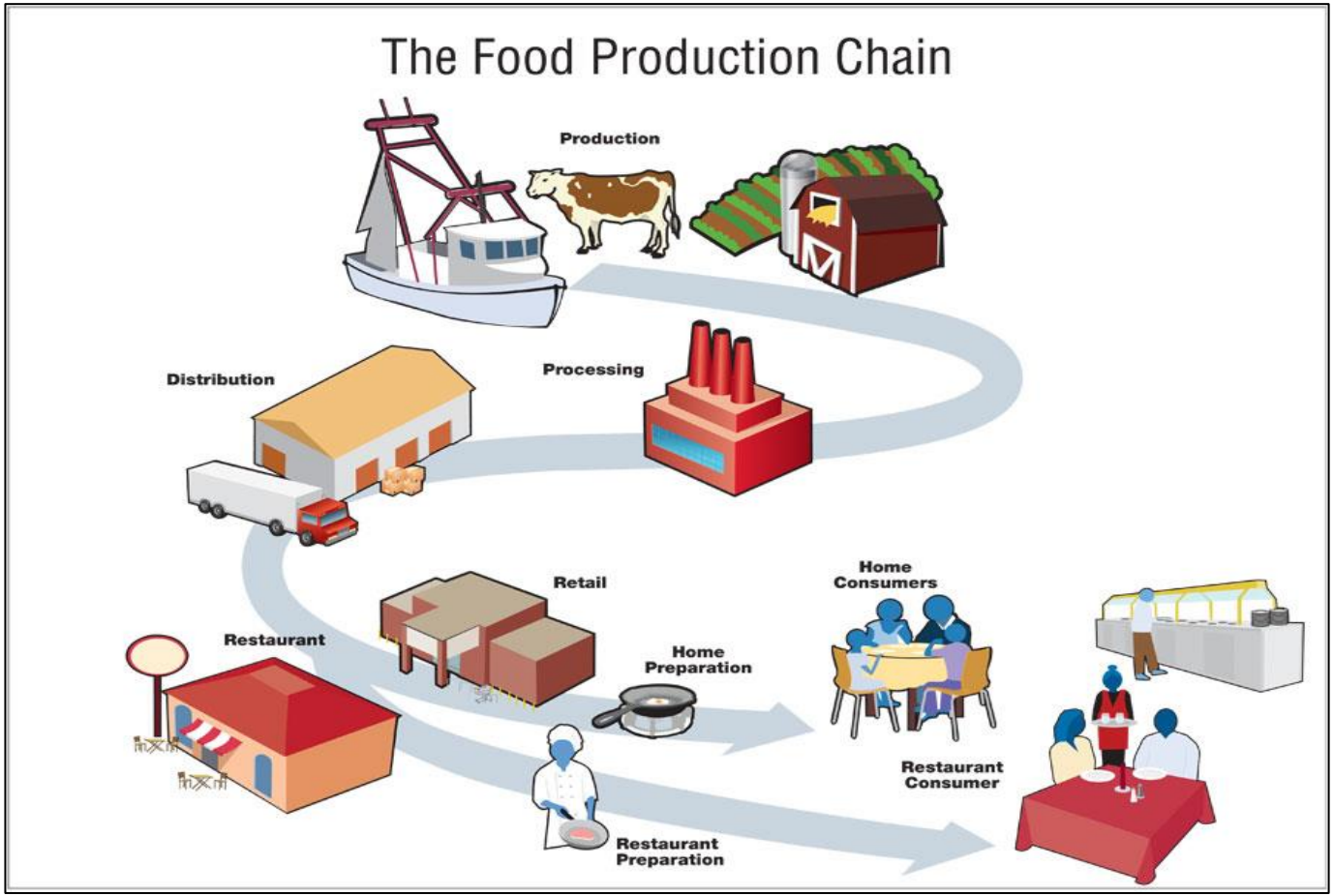


Image Source: CDC, 2022. The Food Production Chain. Food Safety, CDC. https://www.cdc.gov/foodsafety/outbreaks/investigating-outbreaks/figure_food_production.html

Food Production Chain Teacher Cards

Production: How the Food is grown

Distribution: How the product moved from the farm to the eater

Processing: Changing the crop into what is eaten

Consumption: The use of the product by the end Consumer

Distribution

- Trucking
- Marketing and Advertising
- People who build trucks, planes
- Energy workers
- Highway builders
- Food hubs

Production

- Tractor Manufacturers
- Fertilizer manufacturers
- Well diggers
- Farmers
- Construction workers
- Natural gas, petroleum, electricity, solar power manufacturers

Consumption

- Restaurants
- Grocery stores
- Farmers Markets
- Home

Processing

- Honey and maple syrup bottling
- Washing and bagging/banding/boxing produce
- Butchering
- Canning
- Processing Corn into Corn Syrup and Corn Flakes
- Freezing
- Plastic Production for packaging
- Cooking food in our kitchens and restaurants

Waste Management

Collection, transport, treatment, and disposal of waste

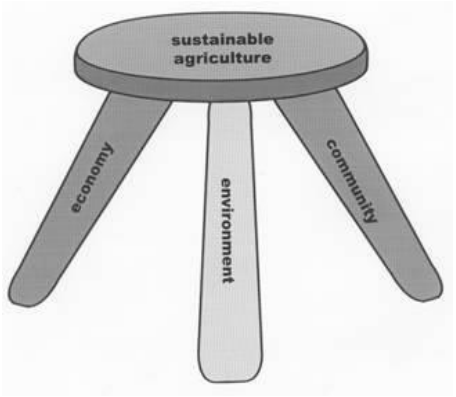





Waste Management

- Sewage after human consumption
- Compost of food scraps
- Trash/Landfill
- Recycling of packaging
- Management of manure
  - Spreading on fields
  - Storing in pits
  - Leaking into waterways

The Three Legs of Sustainability



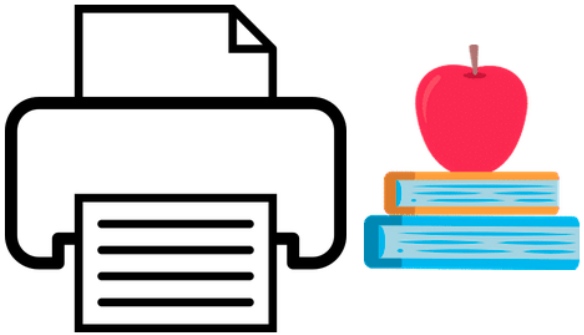
Economy

Environment

Community

Animals in Agriculture

Module 6
OPTIONAL
Teacher Print Kit



Instructions: print **double-sided, on the short-edge.**

Food Up!


Food Up!

Gardener's Secret Scavenger Hunt: Teacher Insect List

Aerators

Pest Managers

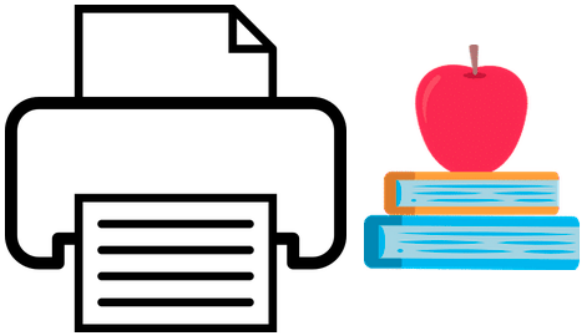
Pollinators

Decomposers

Pest Managers Many insects serve to control pests in the garden. Beneficial insects can eat insects that eat plants or spread disease. Beneficial insects can also dominate areas suitable for the growth of young larvae, making it challenging for pest insects to breed.	**Aerators** Aerating insects create channels in the soil for water and air to move through the soil. Without aeration, roots can lose access to water, the soil nutrients dissolved in the water, and air, creating a detrimental environment for the plants growing in the soil.
Decomposers Decomposing insects break down organic material into usable nutrients for plants (and sometimes animals). These insects help to create excellent soil health, as well as reduce disease by breaking down plant material before harmful bacteria have the opportunity to initiate the decomposition process.	**Pollinators** Pollinating insects transport pollen from one flower to another, enabling the production of fruit and seeds. Many pollinators today are endangered, largely due to pesticide use. About 35% of the world's food crops are dependent on pollinators.[12]

Climate Change and Food:
Why a Changing Climate Matters to You

Module 7
Teacher Print Kit



Instructions: Print one copy of this document as a reference *for the Teacher.* You can print double- or single-sided. Additionally, print the Student Handouts for Module 7.

Food Up!

Optional Teacher Background Reading

“Why Should We Care About Climate Change?”
The Yale Program on Climate Change Communication

"Having different perspectives about global warming is common, but the most important thing that anyone should know about climate change is why it matters. It matters because humans have basic needs, including clean air, fresh water, food, and shelter, which we have developed complex systems to provide. We require that cars capture the pollution that they emit in order to keep our air clean, for example, and we build reservoirs to hold fresh water for cities. We have also built roads, bridges, and tunnels for transportation, and grow specific crops in particular places well-suited for them in terms of temperature and precipitation.

"The many systems our societies depend on were built on the assumption that our weather patterns would be fairly stable -- that we would have sunny and cloudy days, wet and dry days, hot and cold days, but that our local climate (the average of all that weather) -- would always come back to ‘normal’” (1).

Optional Teacher Background Continued...

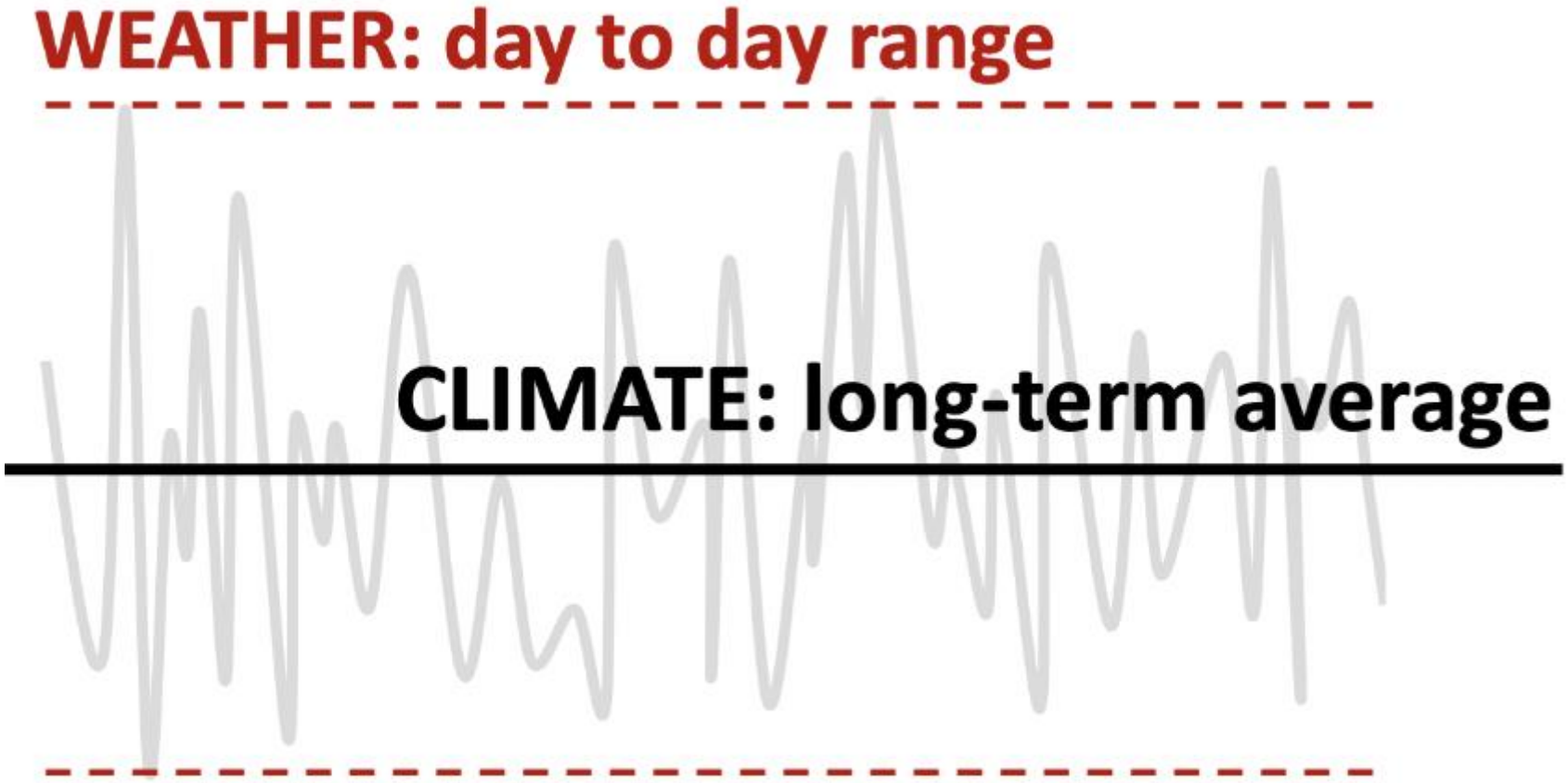
“Unfortunately, when we started to learn about the immense power that we could gain by burning fossil fuels (coal, oil, and gas, which come from ancient plants buried deep underground), scientists also discovered a problem about this power. They discovered that when we dig these materials up and burn them, they produce an powerful, invisible, odorless gas, called carbon dioxide. And they also discovered that this gas acts like a blanket around the planet, trapping heat in the atmosphere. In scientific terms, Earth transforms sunlight’s visible light energy into infrared light energy, which leaves Earth slowly because it is absorbed by greenhouse gases. When people produce greenhouse gases, energy leaves Earth even more slowly—raising Earth’s temperature.

"It took over 100 years for enough gases to build up to a level where we would notice it, but unfortunately we are now able to notice it quite strongly. Scientists have taken thousands upon thousands of measurements using thermometers on land, balloons and airplanes in the air, and buoys and other devices in the oceans. They have determined that our global temperature has risen almost 2 degrees F in the last century, and that most of the extra heat being trapped is going into the oceans, causing them to expand, which increases sea levels along the coast, while causing fish to migrate and sea ice to melt. The increased land temperature is causing glaciers to melt, heat waves and droughts to become more extreme, and it is causing more wildfires to grow out of control.”

Optional Teacher Background Continued...

“Extreme weather is challenging for all of us no matter where we live, but it is also a major problem for all of the systems we have built to provide ourselves with clean air, fresh water, food, and shelter. Heat makes asthma and allergies worse, for example, and flooding from storms causes drainage systems to break down, which can lead to toxic spills and pollution of our fresh water. A changing climate is also very stressful for the crops and irrigation systems that we depend on. Some plants also respond directly to higher carbon dioxide levels in the atmosphere by reducing the nutrients that they take up from the soil. There are countless impacts of a changing climate on our infrastructure, food systems, and our everyday lives, which is why a stable climate matters to all of us, no matter where we live” (2).

Yale Program on Climate Change Communication. Why should we care about climate change?



Graphic taken from "Why should we care about climate change?" by the Yale Program on Climate Change Communication.

WEATHER

Tells you what to wear each day

CLIMATE

Tells you what types of clothes to have in your closet

Activity #2: Greenhouse Gas Effects: A Car Example

Activity #3: Drought

Image credit: Bob Nichols, 2013. Texas drought affecting corn crops. USDA. Creative Commons CC BY 2.0. Food Span.

Activity #3: Climate Change Impacts Teacher Guide

Loss of topsoil

- Extreme heat: Heat dries out soil, making it more vulnerable to wind erosion.
- Extreme weather events: Hurricanes and flooding can damage crops and wash away soil.
- Changing rainfall patterns: Periods without rainfall can dry out soil, making it more vulnerable to wind erosion. Heavy rainfall can wash soil away.
- Rising sea level: Rising tides along coastal waterways can wash soil away.

Fungus invasion in corn crop

- Changing rainfall patterns: Long periods of heavy rain create ideal circumstances for fungal diseases to flourish and damage crops.

Saltwater contamination of freshwater supply

- Rising sea level: A higher ocean tidal range can introduce saltwater into groundwater supplies.

Increased cost to fight weeds

- Extreme heat: Temperatures rise and hardier weeds can outcompete more sensitive crops.

Increase in a crop's water needs

- Extreme heat: Heat dries out soil.
- Changing rainfall patterns: Periods with low rainfall can dry out soil.

Higher food prices

Explain to students that reduced crop yields often lead to higher food prices.

- Extreme heat: Damage from heat-tolerant weed species can lead to crop losses.
- Extreme weather events: Droughts, hurricanes, and flooding can erode soil and damage crops.
- Changing rainfall patterns: Dry periods and heavy rains can erode soil and damage crops.
- Rising sea level: Rising tides can erode soil and higher salinity can damage crops.

Depletion of freshwater sources for irrigation

- Extreme heat: Higher temperatures increase the evaporation rate. Freshwater in rivers, lakes, and groundwater may become depleted if it evaporates faster than it is replenished.
- Changing rainfall patterns: Periods with low rainfall can cause freshwater sources to dry up.

Activity #3: Climate Change Impacts on Agriculture

- Loss of topsoil
- Fungus invasion in corn crop
- Saltwater contamination of freshwater supply
- Increased cost to fight weeds
- Increase in a crop’s water needs
- Higher food prices
- Depletion of freshwater sources for irrigation

Activity #5: Food System Greenhouse Gas Emissions

GHG emissions by food type

Red meat (beef, pork & lamb) 30%

Beverages, sweets, oils and other 21%

Dairy 18%

Cereals & carbs 11%

Fruits & vegs 11%

Chicken, fish & eggs 10%

GHG emissions by supply chain stage

Production: 83%

Transport: 11%

Retail: 6%

ACTIVITY #5: IS YOUR DIET WARMING THE PLANET?

Teacher Notes and Disclaimer on “Climate Food Cards

Health Warnings/Data details:

- Please seek professional advice before making significant changes to your diet. Take into account your own personal circumstances and the necessary balance of many essential vitamins and minerals. For example, it is recommended for vegans to take vitamin B12 supplements.
- Greenhouse gas emissions and water footprints from food production vary significantly depending on the production method and country of origin.
    - For example, see 'Poore, J. & Nemecek, T. (2018). Reducing food’s environmental impacts through producers and consumers. Science.’ You can download here (including all data).
- The conversion between greenhouse gas emissions (g CO2e) and car time depends on the efficiency of the car and the car speed.
- To calculate the number of minutes driving from the g CO2e we had to assume a type of car. Note that cars vary in their emissions per mile. For climate food flashcards version 2, we assumed a typical UK car which causes 155 g CO2e / km.
- We also needed to assume a car speed. In this version we assumed the car is driving at 40 mph.
- For extreme enthusiasts and data geeks, you can see the full information used to make the cards here.

TAKE A BITE OUT OF CLIMATE CHANGE

The Value Within Our Food

Module 9
Teacher Print Kit

Instructions: Print one copy of this document as a reference *for the Teacher.* You can print double- or single-sided.

Food Up!

Activity #1 Answer Key: Food Loss

Production

Drought or Storm impacting food yields

Pests feed off of crops and harvest

Crop loss due to lack of access to technology

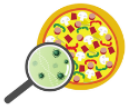
Food becomes unprofitable to sell and is not harvested or delivered

Storage

Crops spoiled due to inadequate storage

Food contaminated from bacterial exposure when poorly handled

Distribution



Food contaminated from bacterial exposure when poorly handled

Crops are unable to be transported due to lack of infrastructure

Processing

Removal of edible food portions, such as fat, skin, and peels

Packaging

Food becomes stale or spoils fast from inadequate sealing

Food left on plate from too large of a portion

Activity #1 Answer Key: Food Waste

Marketing

Food becomes unprofitable to sell and is not harvested or delivered

Unsold food thrown away in grocery stores

Consumers throw out edible food due to confusion of food labels

Food deemed too 'ugly' to sell or accept

Retail

Food deemed too 'ugly' to sell or accept

Unsold food thrown away in grocery stores

Consumption

Food becomes spoiled in your home

Food left on plate from too large of a portion

Consumers throw out edible food due to confusion of food labels

Consumers overbuy products with not enough time to eat it all

Edible, safe food thrown away

Activity #2 Answer Key: Discovering the True Costs

	ONE loaf of bread	**ONE** pound of beef	**ONE** serving of cheese (100g)	**ONE** gallon of milk	**ONE** chocolate bar (100g)
Pounds of **Carbon Dioxide**	1 Lbs. 1 small pompom	35 Lbs. 6-8 large pompoms	6 Lbs. 6 small pompoms	20 Lbs. 4-5 large pompoms	2 Lbs. 2 small pompoms
Gallons of **Water**	150 gallons of water. 3 small pompoms	1,800 gallons of water. 12 large pompoms	670 gallons of water. 5 large pompoms	880 gallons of water. 6 large pompoms	450 gallons of water. 3 large pompoms
Kilocalories of **Energy**	95 kilocalories. 1 small pompom	25,840 kilocalories. 26 large pompoms	350 kilocalories. 3-4 small pompoms	2,400 kilocalories 3 large pompoms	406 kilocalories. 4 small pompoms.
Squared Feet of **Land** Used	1 ft^2 0-1 small pompoms	1770 ft^2 18 large pompoms	110 ft^2 1 large pompom, 1 small pompom	300 ft^2 3 large pompoms	120 ft^2 1 large pompom, 2 small pompoms

The Food Waste Pyramid