



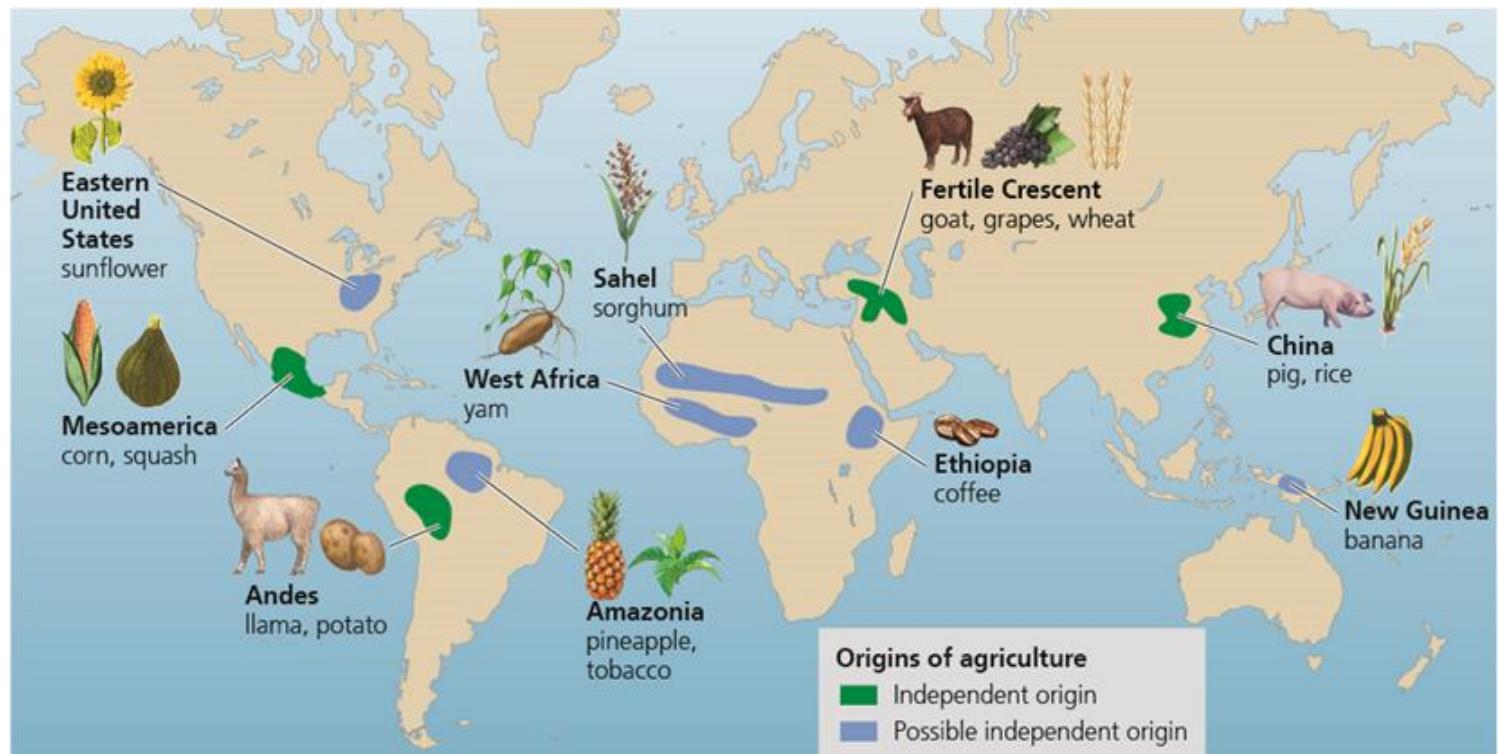
# Ch. 7: Soil, Agriculture, & the Future of Food



Is this what you  
think agriculture  
looks like?

# Agriculture arose ~10,000 years ago

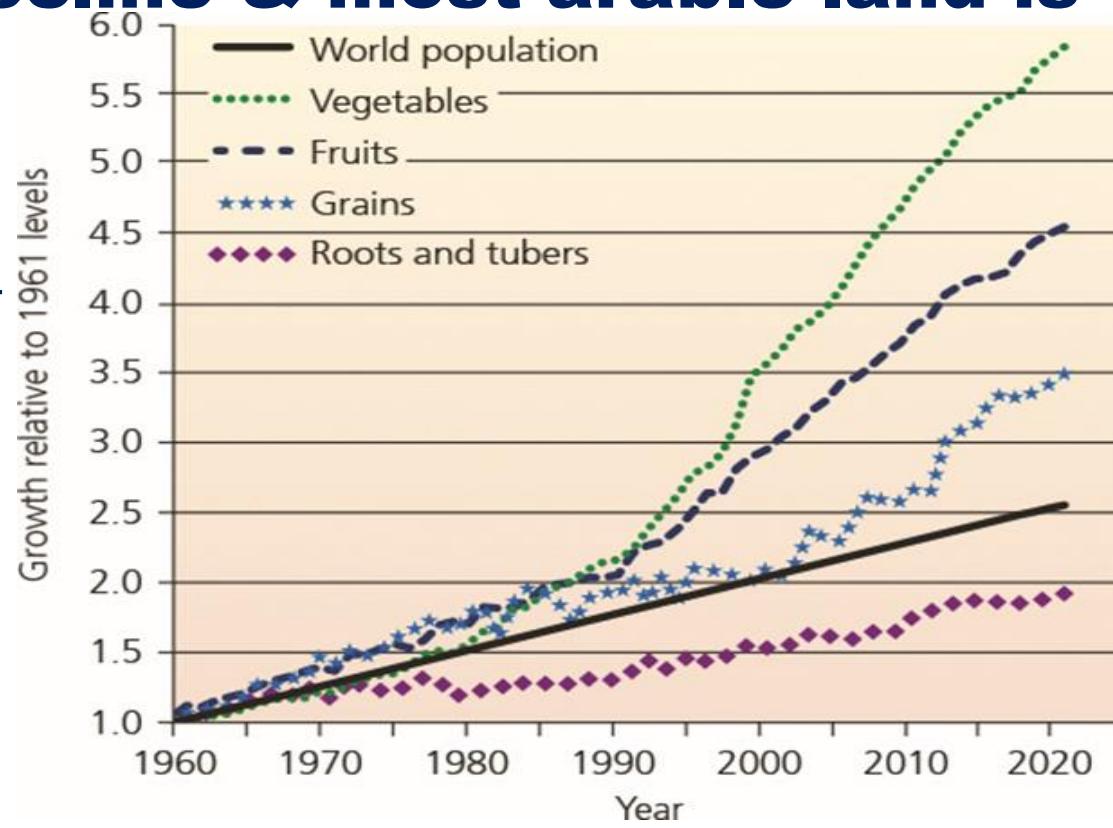
- 5 Different cultures independently invented agriculture
- Earliest plant & animal domestication was in the “Fertile Crescent” of the Middle East
  - Wheat, barley, rye, peas, lentils, onions, goats, & sheep
- Allowed for development of society as some lived off food produced by others



# Today, we produce more food per person

- Food production exceeds population growth
- We produce food through technology
  - Fossil fuels, irrigation, fertilizer, pesticides, cultivating more land, genetic engineering
- BUT, soils are in decline & most arable land is already farmed
- 735 million people are undernourished (not enough calories)

*By 2050, we will need to feed 9 billion people*

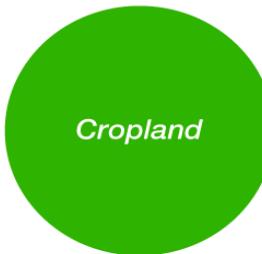


# Agriculture's Footprint

**Undeveloped: 46.5%**  
23.4 million square miles

**Agriculture: 38.6%**  
19.4 million square miles

**Other: 14.9%**  
7.5 million square miles



Erosion



Rural housing  
and businesses



Urban areas



Planted forests



Logging



Mines, quarries,  
roads, railways,  
reservoirs

**Farming of both  
livestock & crops is the  
largest human endeavor on Earth  
using up 38.6% of ice-free land**

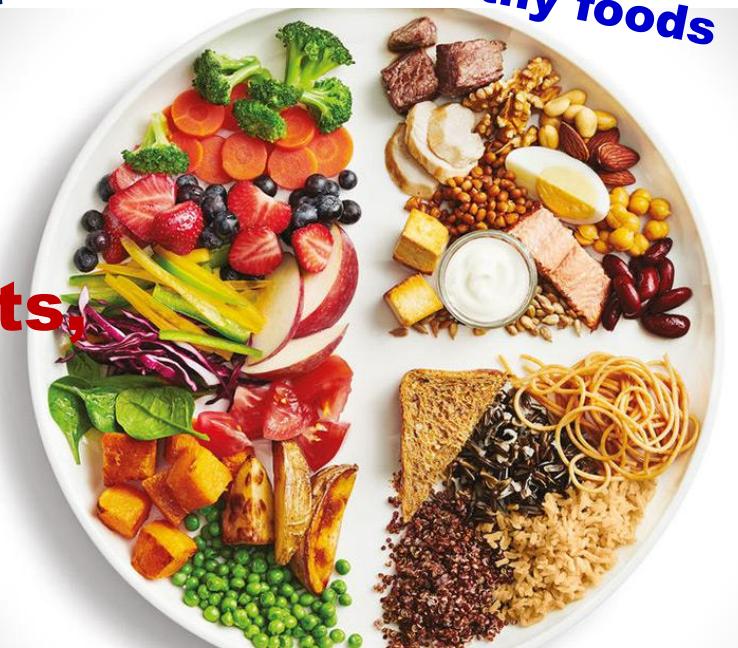
Total surface area of Earth, including water:  
196.9 million square miles

**Eroded land  
is not usable  
for farmland  
or for wildlife**

**We have  
already  
cleared an  
area the  
size of South  
America to  
grow crops & an  
area the size of  
Africa to raise  
livestock**

# Overnutrition & Ultraprocessed Food

- Receiving too many calories each day (often low quality)
- Developed countries have abundant, cheap junk food, & people lead sedentary lives
  - Leads to obesity, heart disease, diabetes, cancer
- Ultraprocessed food: Industrial formulations of heavily processed “foods” that contain multiple additives not used in home cooking:
  - Preservatives, emulsifiers, sweeteners, hydrogenated fats, synthetic colors & flavors, refined grains (chips, soda, instant soup, pastries, white bread, chicken nuggets)



- Become a label reader!
- Eat whole, real food
- Eat more fiber
- Learn to cook a few meals at home

**Almonds are a healthier snack – just 2 ingredients (almonds & salt)**



## Nutrition Facts

1 serving per container  
Serving size 1 package

Amount per serving  
**Calories 150**

% Daily Value*	
Total Fat 8g	10%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 190mg	8%
Total Carbohydrate 17g	6%
Dietary Fiber 1g	5%
Total Sugars less than 1g	

Protein 2g

Vit. D 0mcg 0% • Iron 0.3mg 0%	Calcium 40mg 2% • Potas. 60mg 0%
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Not a significant source of added sugars.

\* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

INGREDIENTS: CORN, VEGETABLE OIL (CORN, CANOLA, SOYBEAN, AND/OR SUNFLOWER OIL), AND LESS THAN 2% OF MALTODEXTRIN (MADE FROM CORN), SALT, WHEY, CHEDDAR CHEESE (MILK, CHEESE CULTURES, SALT, ENZYMES), BUTTERMILK, MONOSODIUM GLUTAMATE, ARTIFICIAL COLOR (RED 40 LAKE, YELLOW 6 LAKE, YELLOW 6, YELLOW 5), NATURAL AND ARTIFICIAL FLAVORS, ROMANO CHEESE (COW'S MILK, CHEESE CULTURES, SALT, ENZYMES), ONION POWDER, CITRIC ACID, SPICES, DEXTROSE, TOMATO POWDER, POTASSIUM SALT, WHEY PROTEIN CONCENTRATE, LACTOSE, LACTIC ACID, SCOURING CASEINATE, SUGAR, GARLIC POWDER, SKIM MILK, RED AND GREEN BELL PEPPERS, MILK PROTEIN CONCENTRATE, DISODIUM INOSINATE, AND DISODIUM GUANYLATE.  
CONTAINS MILK INGREDIENTS.

**Doritos - MANY ingredients, most are industrial additives**



**An apple has just 1 ingredient!**





# Understanding Ultra-processed foods with Professor Tim Spector

BBC MAESTRO

**Dr. Tim Spector is a science writer & Medical Doctor of Epidemiology  
(studies disease causes, impacts, & prevention)**

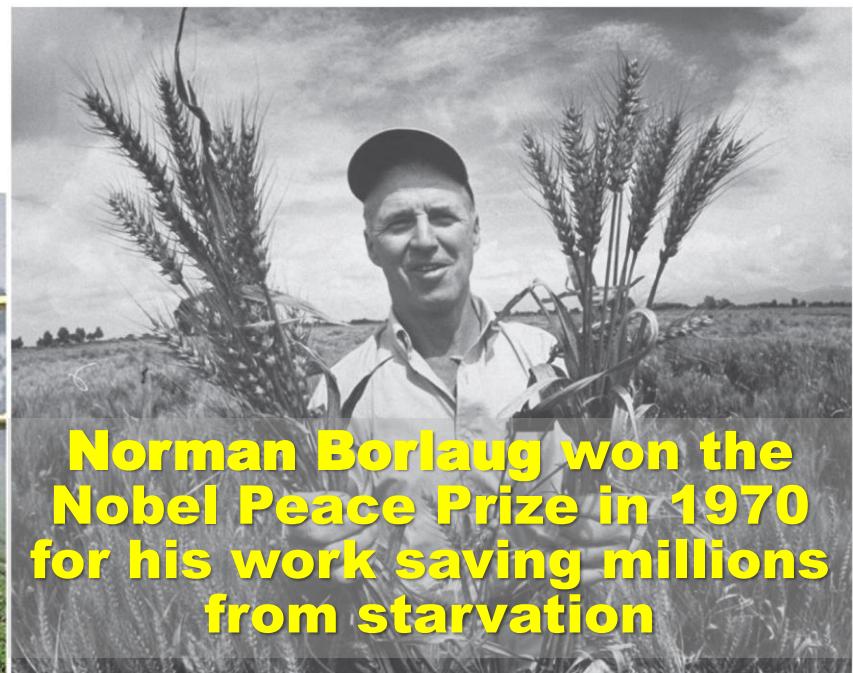
**[https://youtu.be/FIqPSFJyTg8?si=ISH-6gCnSN\\_4IYaR](https://youtu.be/FIqPSFJyTg8?si=ISH-6gCnSN_4IYaR)**

# The Green Revolution increased crop yields

- Introduction of modern farming techniques & high yield crops (wheat, rice, corn)
  - Spread to developing world in 1940s–1970s
  - Significantly increased food production

**But, depended on lots of:**

- Synthetic fertilizers
- Chemical pesticides
- Machinery & fossil fuel
- Irrigation
- Monocultures



**Norman Borlaug won the Nobel Peace Prize in 1970 for his work saving millions from starvation**

**Producing or growing a single crop or plant species over a wide area, for a large number of consecutive years**



**A significant part of modern, industrial agriculture**

**Feedlots are the monoculture equivalent in the production of large numbers of livestock animals**



**Monoculture**



**Palm oil Plantation**



# Monocultures

- Efficient: saves time & money.....**BUT**
- Susceptible to pests & disease: spread rapidly when 1 species is close together
- Rely heavily on pesticides, antibiotics
- Crops deplete organic soil nutrients
  - Crop yields ↓ over time
  - Rely on synthetic fertilizers
- Devastates biodiversity
- Human diet is narrowed: 90% of our food comes from only 15 crop & 8 livestock species!



**Cattle  
monoculture**

# Agriculture Needs to be Sustainable

- Feeding Earth's rising human population requires changing our diet or increasing agricultural production

- But land suitable for farming is running out

- We must improve the efficiency of food production & decrease our impact on natural systems



Topsoil is blown away

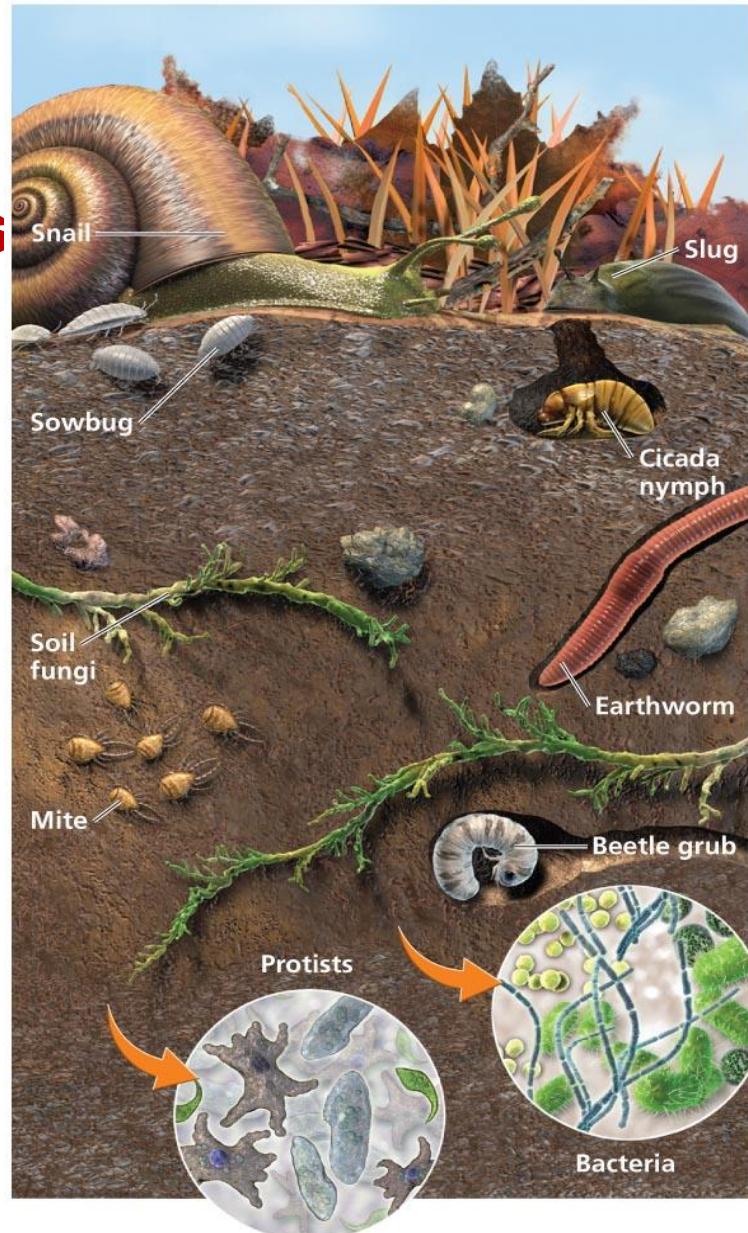
- Sustainable agriculture maintains healthy soil, clean water, pollinators, & other vital resources while reducing chemicals

- Overall approach is to mimic the way natural ecosystems function



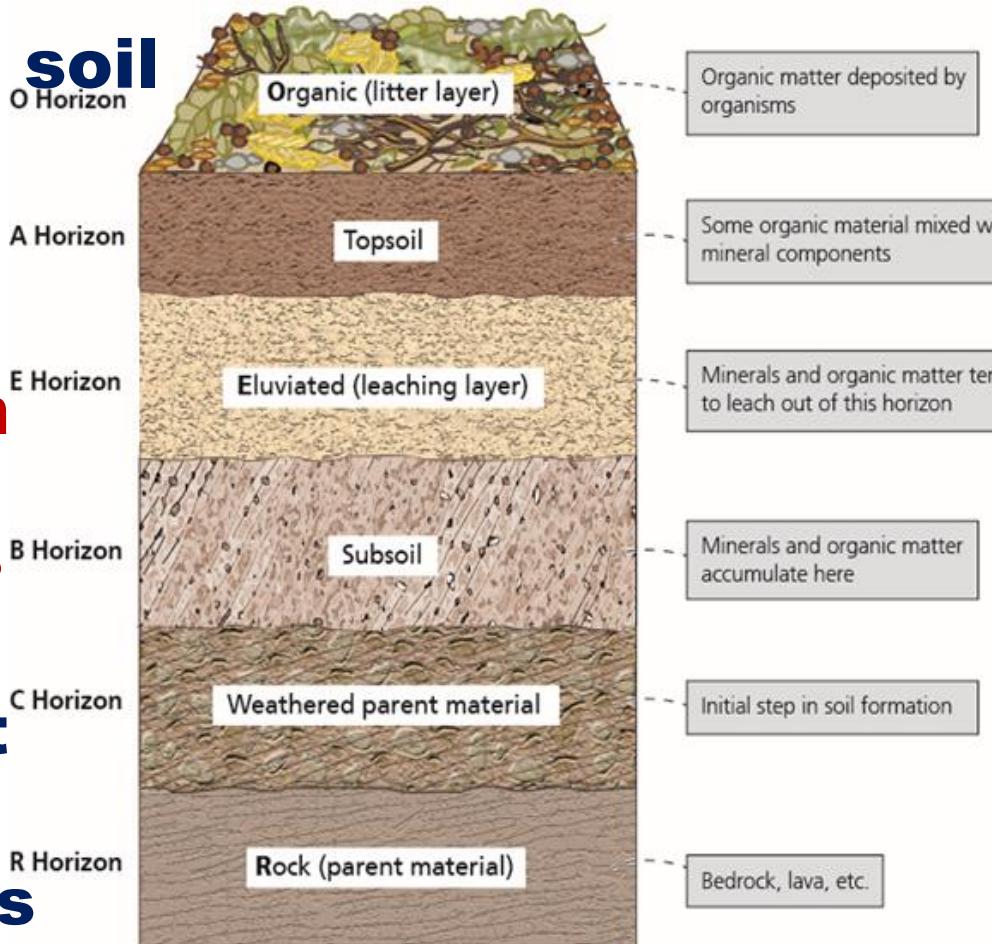
# Soil is the foundation of agriculture

- **Consists of disintegrated rock & minerals, gases, water, & organic matter:**
  - Dead & live microorganisms
  - Decaying material
  - Bacteria, algae
  - Habitat for earthworms, insects, mammals, reptiles, & amphibians
- 50% mineral matter, 5% organic matter, & 45% pore space
- A renewable resource that can be depleted



# Soil profile

- **Horizon:** each layer of soil



- **Leaching:** dissolved particles move down through horizons

– **Pollutants can leach into drinking water, making it hazardous**

- **Topsoil:** inorganic & organic material most nutritive for plants

- In **rainforests**, nutrients are in plants, not the soil

– **Rain washes away minerals & nutrients, reducing their accessibility to roots**

– **Rapid decomposition of leaf litter results in a thin topsoil layer with little fertile, spongy humus**

# Regional Soil Types Affect Agriculture

- **Swidden (Slash & Burn) Agriculture** is traditionally used in tropical areas where ash from burned forests provide nutrients for crops because rain washes soil nutrients away
  - Farmers cut & burn forest, plant crops. Crops deplete soil of nutrients, so plots are abandoned after cultivation
  - Not sustainable at high population densities

Temperate grasslands have less rainfall & nutrient leaching

Dead plants decay to add nutrients & make thick topsoil

No need for slash & burn in grasslands



Much of tropics are going up in smoke

(a) Slash-and-burn agriculture on nutrient-poor soil in the tropics

# Erosion by wind or water removes soil

**U.S.A loses 5 tons of soil for every ton of grain harvested**

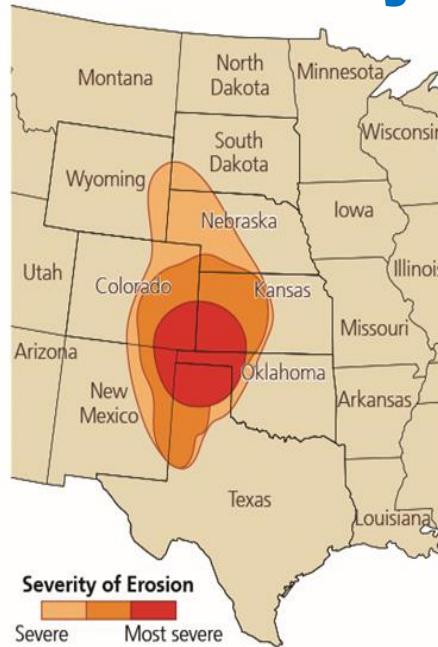
**1930's American Dustbowl**

**Grew wheat & grazed cattle, removed vegetation**



(a) Kansas dust storm, 1930s

**Left fields fallow (exposed soil for long periods)**



**Desertification of Mongolian grasslands**



**Tree clear-cutting over large areas, especially on slopes**



**Farming on slopes without soil retention methods**



**Feedlot erosion pollutes watersheds**

# **Desertification reduces productivity**

- 1930's dustbowl created desert conditions in U.S. prairie region, conservation saved area
- Desertification = a loss of more than 10% productivity through:
  - Erosion, soil compaction Impedes plant regrowth as compacted soil holds less water. Water can't be absorbed by the soil, it simply flows off
  - Deforestation & overgrazing
  - Drought, salinization, water depletion
  - Climate change
- Most common in arid (dry) & semi-arid areas





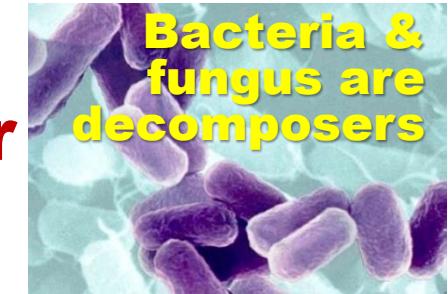
## Protecting Soil With Sustainable Agriculture



# Synthetic Chemical Fertilizers

- Replace soil nutrients that plants use to boost yields, BUT

- Don't replace soil's organic matter
  - Don't create proper soil chemistry for detritivores & decomposers (reduces nutrient cycling)
  - Don't prevent compaction (water & air can't get to roots)



- Use at wrong time of year (before rain), or using too much fertilizer (plants can't use all) causes:

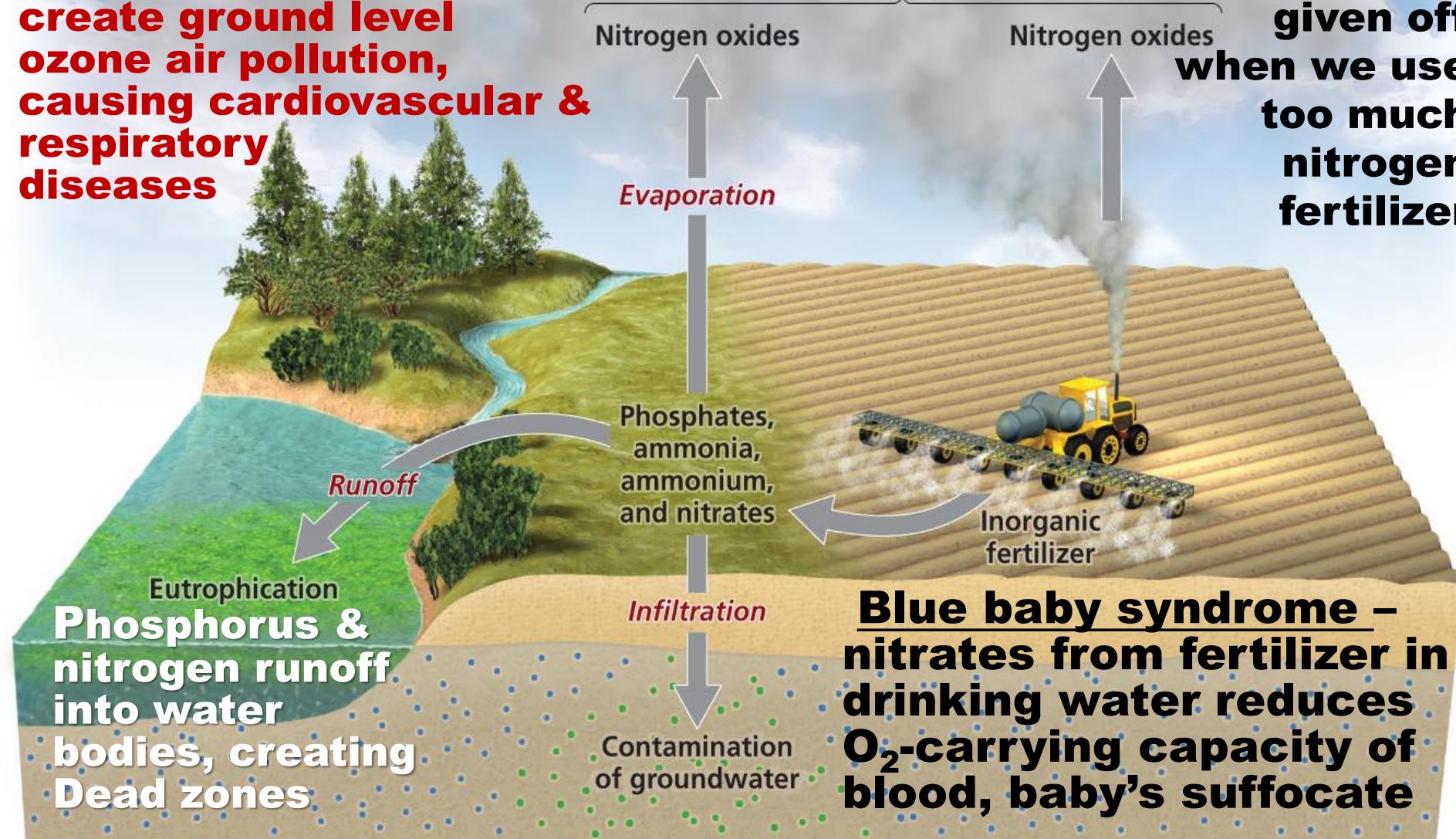
- Air & water pollution
  - Cancer, blue baby syndrome, thyroid & immune disorders



# Environmental effects of overfertilizing

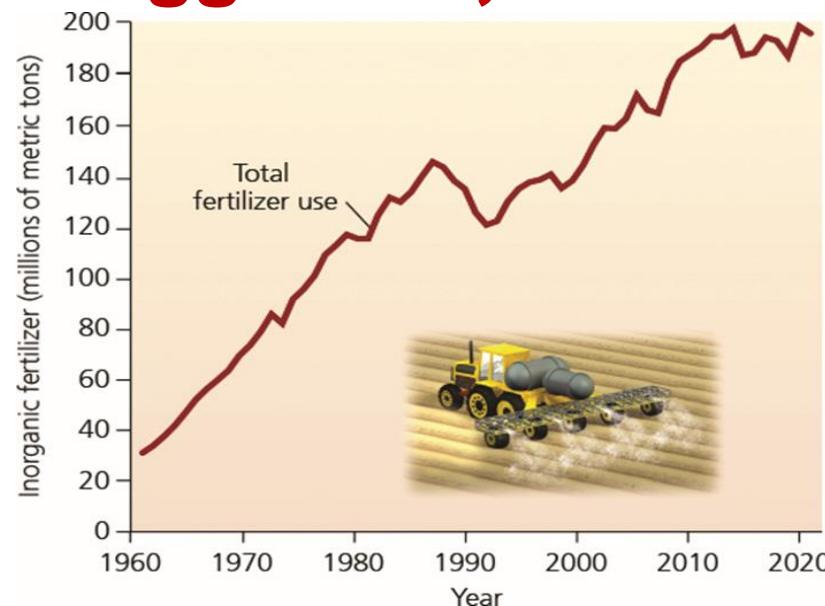
**NO<sub>2</sub> mixes with other pollutants (volatile organic compounds – VOCs) to create ground level ozone air pollution, causing cardiovascular & respiratory diseases**

**Nitrogen dioxide (NO<sub>2</sub>), a powerful greenhouse gas that contributes to climate change, is given off when we use too much nitrogen fertilizer**



# Organic vs. Inorganic (Man-made) Fertilizers

- **Inorganic fertilizers = mined or synthetically manufactured mineral supplements**
- **Organic fertilizers = the remains or wastes of organisms**
  - **Animal manure, crop residues, fresh vegetation**
  - **Compost = produced when decomposers break down organic matter (plant waste, eggshells, food waste, wood, paper.....)**



# We have thousands of pesticides

- **Pests:** organism that damages valuable crops

- **Weed:** unwanted plants that compete with crops



- **Pesticide:** poison that target pest organisms

- **Insecticides** = kill insects

- **Herbicides** = kill plants

- **Fungicides** = kill fungi

- 1 billion lbs of pesticides applied in U.S. each year

- Worldwide, \$59 billion per year is spent on pesticides



- Pesticides cause significant human health issues

- Also kill non-target organisms, including pollinators & predators/parasites of pests

# Pests evolve resistance to pesticides

- **Chemical pesticides become less effective over time as pests evolve resistance to them**
- **Most pests occur in huge numbers, so some will have genes that detoxify or metabolize a given pesticide**
  - **Individuals that are genetically immune to a pesticide pass these genes to their offspring**
- **Weeds & plant diseases (fungus, bacteria) have also evolved resistance to pesticides**



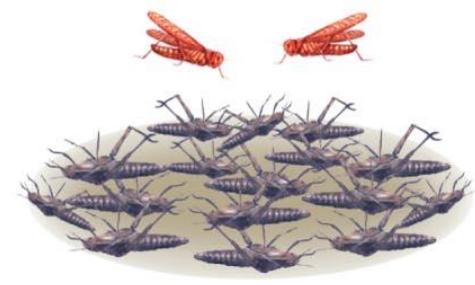
- Individuals with the gene will survive & reproduce at greater rates, creating a new generation with a much higher rate of carrying the gene
- Eventually, the pesticide becomes ineffective & must be replaced by a new one, creating a “pesticide treadmill”



① Pests attack crops



② Pesticide is applied



③ Most pests are killed. A few with innate resistance survive



④ Survivors breed and produce a pesticide-resistant population



⑤ Pesticide is applied again



⑥ Pesticide has little effect. New, more toxic, pesticides are developed

# Biological control (biocontrol)

- Uses a pest's natural predators or pathogens to control the pest
  - Reduces pest populations without chemicals
  - Reduces chemical use
- ***Bacillus thuringiensis* (Bt): naturally occurring soil bacteria that kills many pests, but does not harm wildlife or humans**
  - Bt is highly effective & used in organic farming

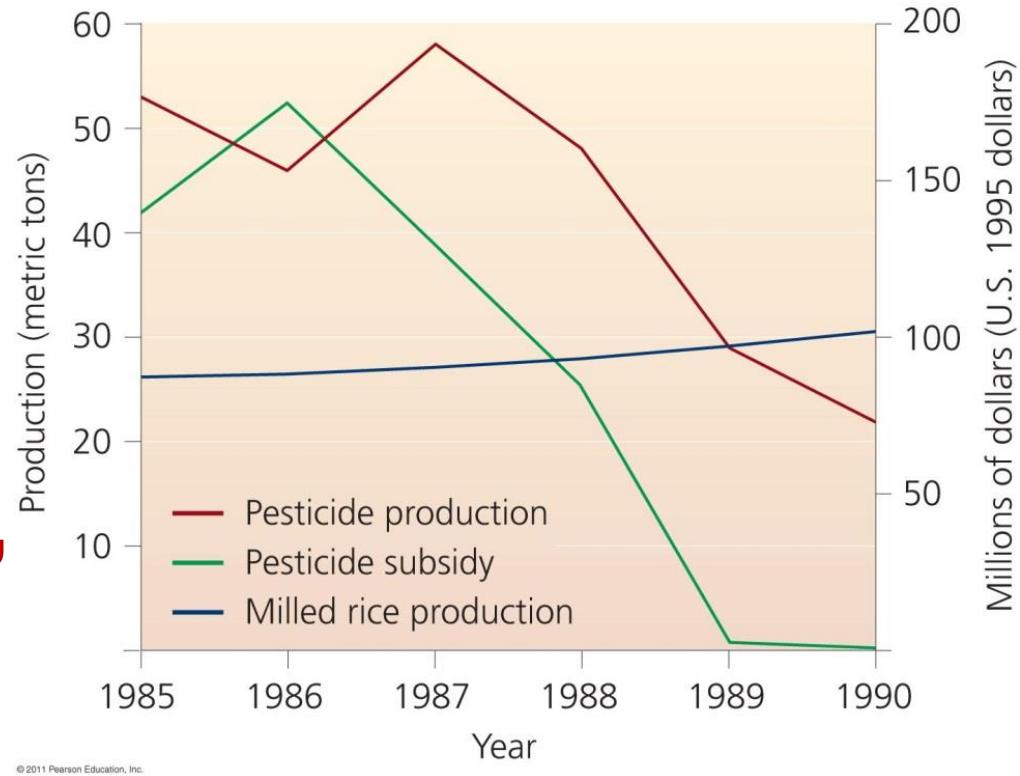


- Parasitoid wasps & ladybugs are natural enemies of many pests



# Integrated Pest Management (IPM)

- Best techniques from organic & industrial farming combined to suppress pests
  - Biocontrol
  - Chemicals, if necessary
  - Population monitoring (drones, sensors, robots)
  - Habitat alteration
  - Crop rotation & transgenic crops
  - Alternative tillage methods
  - Mechanical pest removal



**IPM in Indonesia increased rice yields 13% & saved \$179 million/yr in phased-out subsidies**

# Reducing Pests & Protecting soil

- **Crop rotation:** growing different crops from one year to the next



- Returns nutrients to soil
- Prevents erosion & reduces pests
- Wheat or corn & soybeans

- Beans & legumes fix (remove) nitrogen from air & adds it to soil, increases fertility

- **Intercropping:** planting different crops in alternating bands

- Increases ground cover

- Replenishes soil

- Decreases pests & disease



(d) Intercropping

# We depend on insects to pollinate crops

- Not all insects are pests; some are absolutely vital
  - 800 crop species rely on insect pollinators
- Pollination: male plant sex cells fertilize female sex cells
  - By wind or animals
- Pollinators include:
  - Hummingbirds
  - Bats
  - Insects (bees, wasps, etc.)

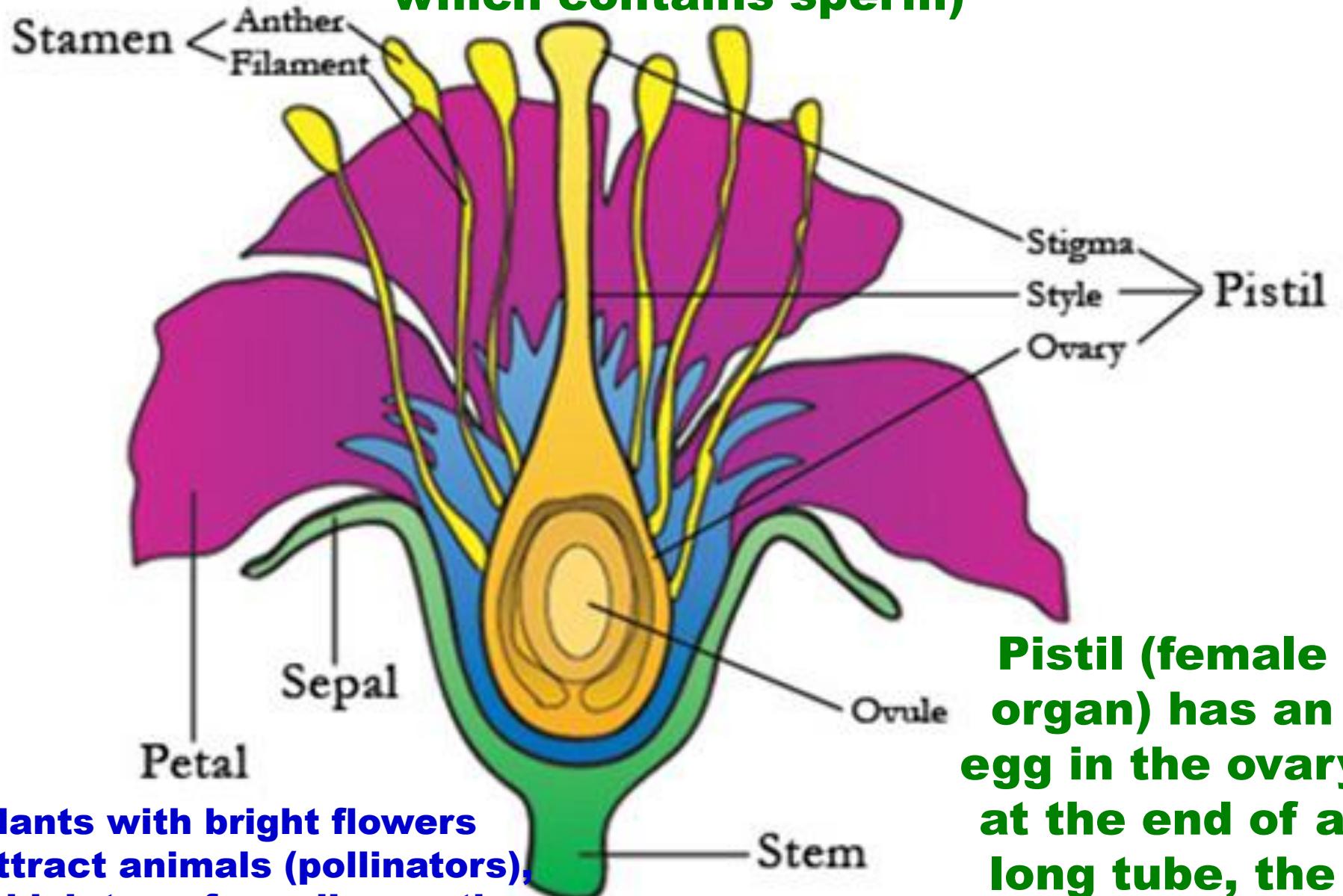
Animals pollinate ~  
1 out of every 3  
bites of food  
we eat



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**Flowers are evolutionary adaptations to attract pollinators**

**Stamen (male organ) has pollen on it, which contains sperm)**



**Pistil (female organ) has an egg in the ovary at the end of a long tube, the style)**

**Plants with bright flowers attract animals (pollinators), which transfer pollen as they move from flower to flower**

# Conservation of pollinators is vital

- **Populations of pollinators have plummeted**

- **Colony collapse disorder:**

- entire beehives have vanished**

Parasite introduces fatal  
virus to bees



- Exact cause unknown: Insecticides, introduced parasites (varroa mite), habitat loss, simplification of their diet (climate change exacerbates the problem)**

- **Restoring bee populations will require:**

- Growing more wildflowers & flowering plants near farms & in cities**

Bees pollinate over 800 crops and contribute \$15 billion in services/year

- Decreasing use of chemical insecticides**

- Protecting natural habitats**



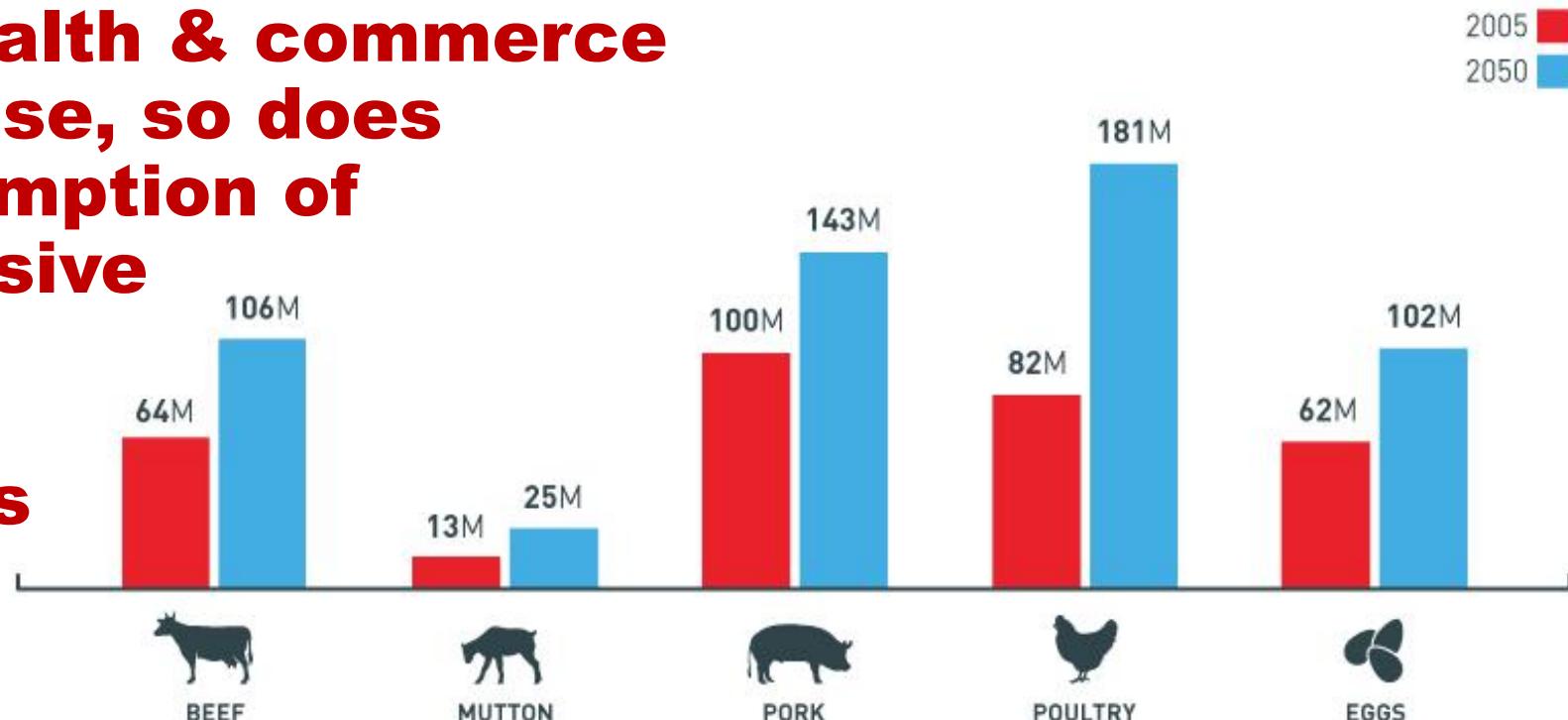
# Consumption of Meat & Animal products

- Global demand will double between 2000-2050
- Fueled by human population growth (9 billion by 2050) & increased wealth in developing world

**GLOBAL DEMAND FOR MEAT**  
2005 vs. 2050  
(in tonnes)

Since 1950, global meat production increased fivefold

- As wealth & commerce increase, so does consumption of expensive meat, milk, & eggs



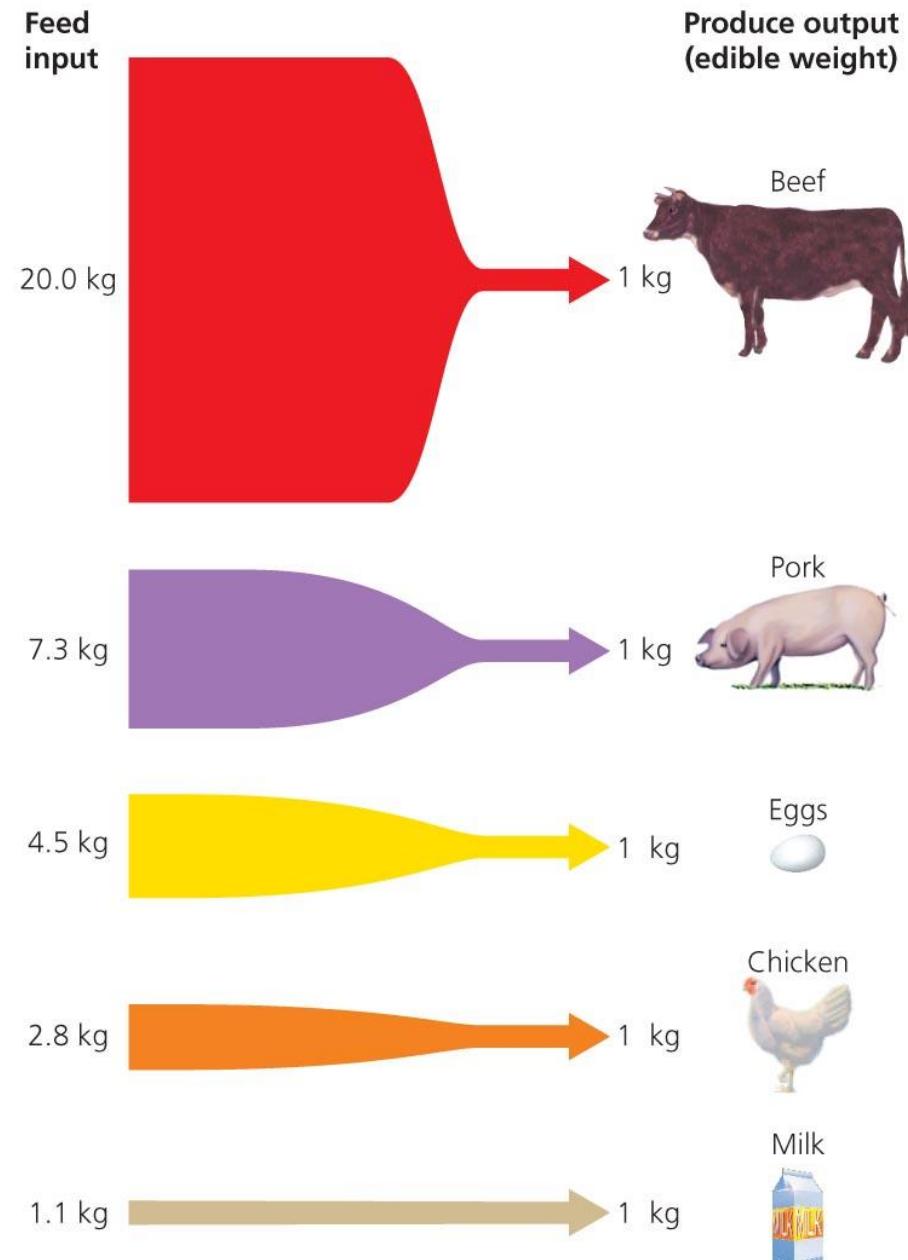
# Our Food Choices are Resource Choices

**Eating meat is far less energy efficient than eating plant crops**

**90% of energy is lost from one trophic level to the next**

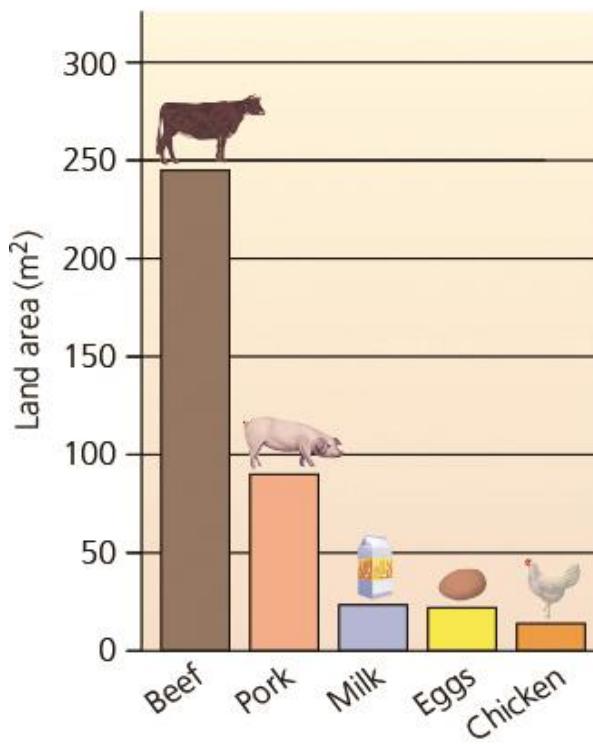
- **Eating plants & lower on the food chain feeds more people**

**Some animals convert feed into meat more efficiently than others**

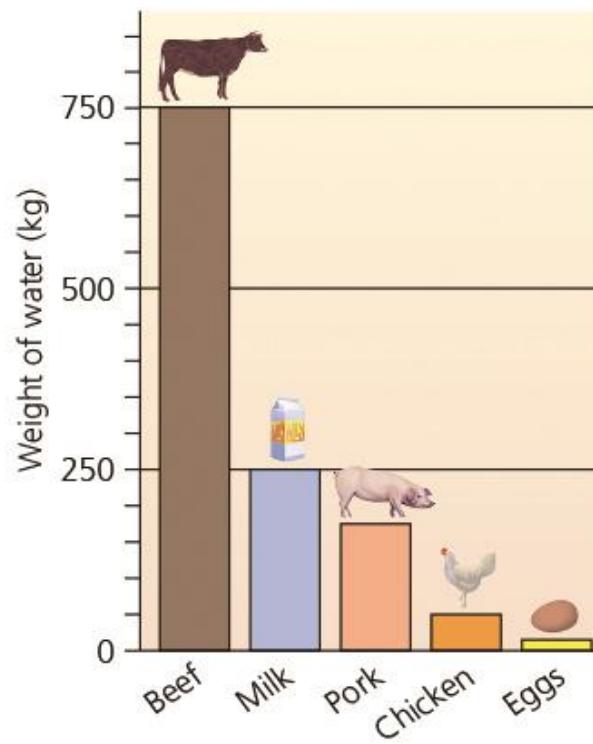


# Resources required for livestock production

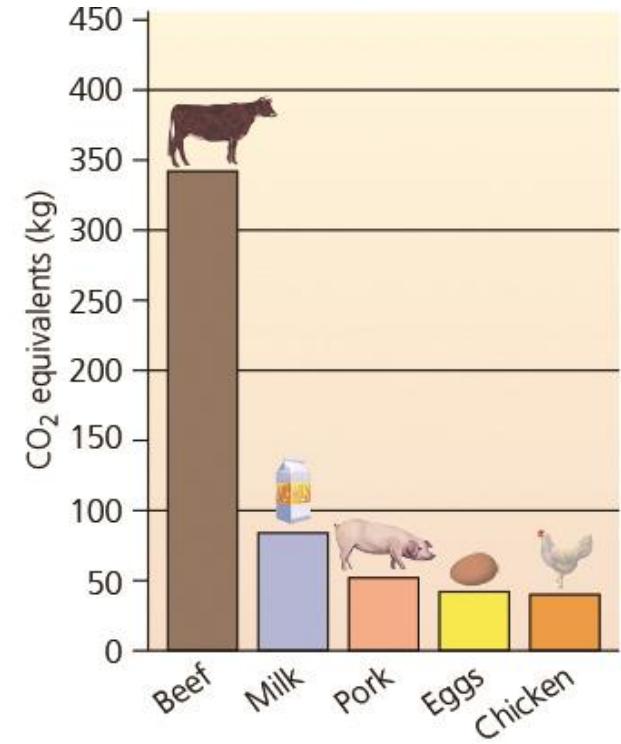
- Land area & water required & greenhouse gas emissions released in order to produce 1 kilogram of edible protein
  - Eggs & chicken (for meat) requires fewest resources, beef requires the most, by far



(a) Land required to produce 1 kg of protein



(b) Water required to produce 1 kg of protein



(c) Greenhouse gas emissions released in producing 1 kg of protein

# Feedlot agriculture

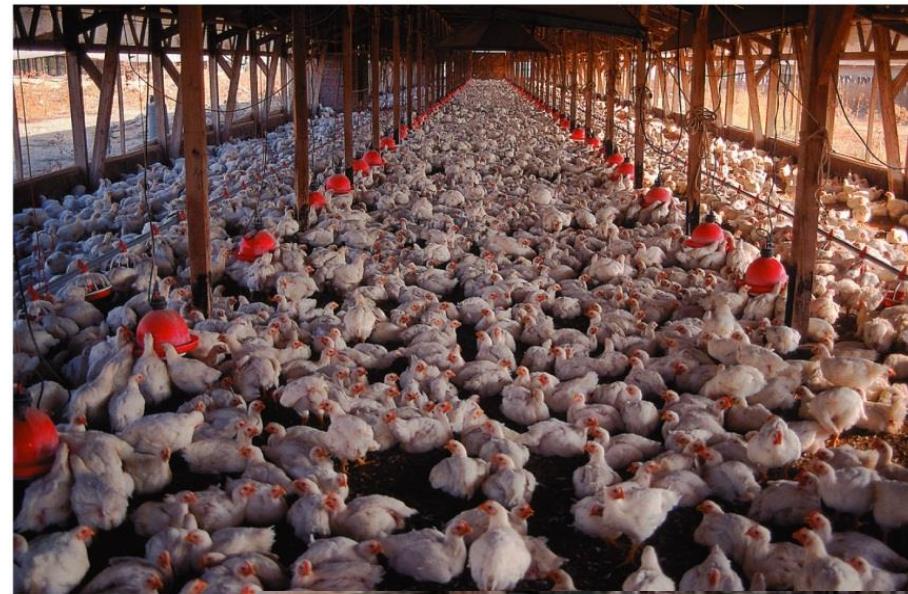
- **Factory farms (CAFOs): Concentrated Animal Feeding Operations**
- **Huge warehouses or pens deliver food to animals living at extremely high densities**

**Over half of world's pork & most of its poultry**

**U.S. farms house millions of de-beaked chickens in crowded cages (10 US states ban battery cages)**

**European Union banned battery cages (2012), California banned in 2015 (calves & pigs too)**

(a) Chicken factory farm in Arkansas



**Battery cages**

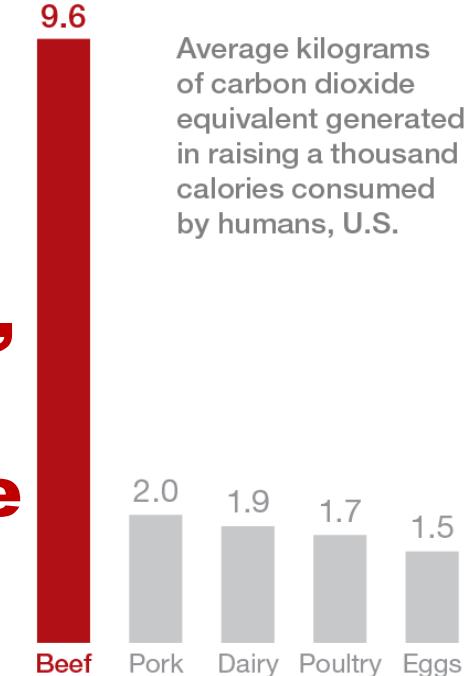


## Concentrated Animal Feeding Operations (CAFOs)



# Feedlots pollute water & air

- Produce huge amounts of manure & urine
- Causes eutrophication, waterborne pathogens (*Salmonella, E. coli*) sicken people
- Crowded, dirty conditions cause outbreaks in disease
- Heavy use of antibiotics, hormones, heavy metals (increase growth)
- Chemicals are transferred to people
- Microbes evolve resistance to antibiotics
- Air pollution: odors, ammonia (acid rain)
- More greenhouse gases (CO<sub>2</sub>, methane, nitrous oxides) than auto emissions

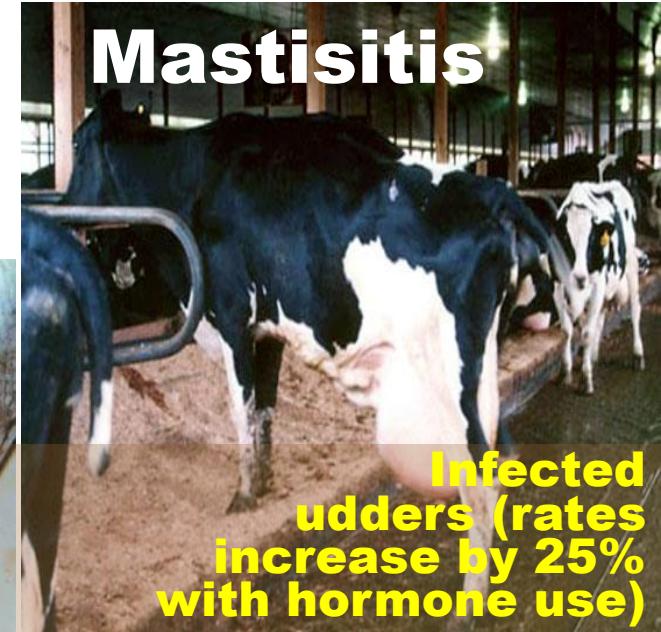


# Antibiotics

- 70% of most medically important antibiotics in USA are given to animals, not humans
- Antibiotic use on farms increased as more animals are raised in crowded, unsanitary conditions on factory farms - fertile breeding grounds for bacteria & infections
  - Cows are susceptible to infections & liver abscesses as they are often fed a corn-based diet despite having evolved to eat grass
  - Create Antibiotic Resistant Bacteria - Spread to humans
  - Decreases effectiveness of Antibiotics for human medicine
  - Must develop stronger antibiotics



Salmon Lice



Mastitis

Infected udders (rates increase by 25% with hormone use)

# Hormones

- Given to dairy cows to increase milk yield 10-20%
- Bovine Growth Hormone (rBGH / rBST) & estradiol (estrogen)
  - Linked to breast, prostate, & colon cancer (due to increased cell growth & metabolism), early onset puberty, reproductive problems (infertility)
  - Pollutes water & harms aquatic species
  - Banned: EU, Japan, Australia, NZ, Canada (EU bans USA dairy products)
  - In all U.S. dairy unless organic or product states “No rBST/rBGH”
  - None in imported EU cheese
- Also given to farmed salmon, beef cattle, etc. to promote growth
- USDA does not allow hormones or steroids in chickens



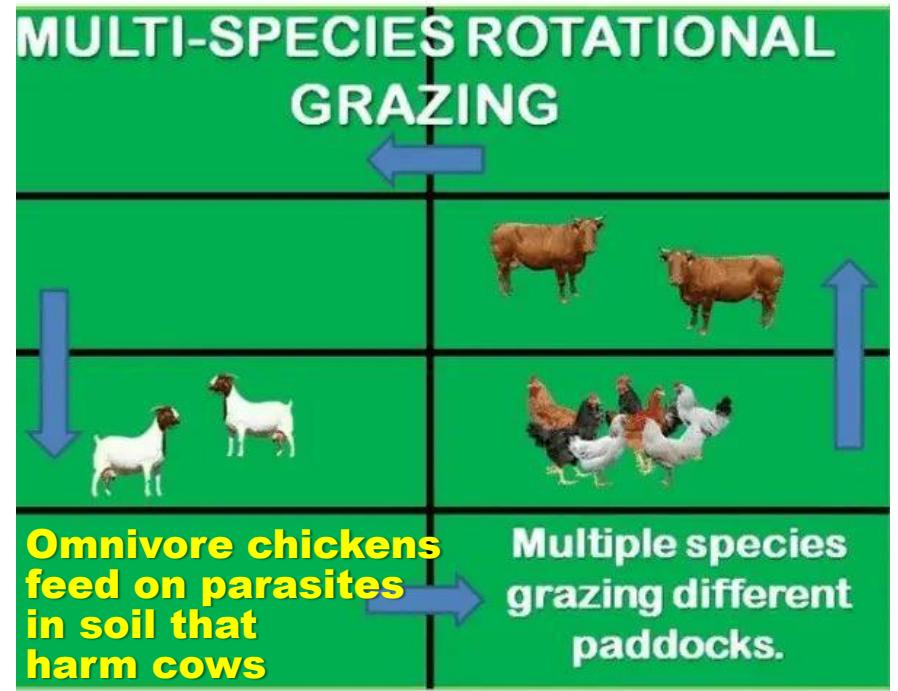
## Feedlot Alternatives:

- Pasture-raised, grass-fed, free range
- Healthier animals (normal diet & behavior), fewer pharmaceuticals given to livestock
- Healthier meat (higher in Omega-3 fatty acids)
- We have to eat less meat to allow for this less intensive form of raising animals



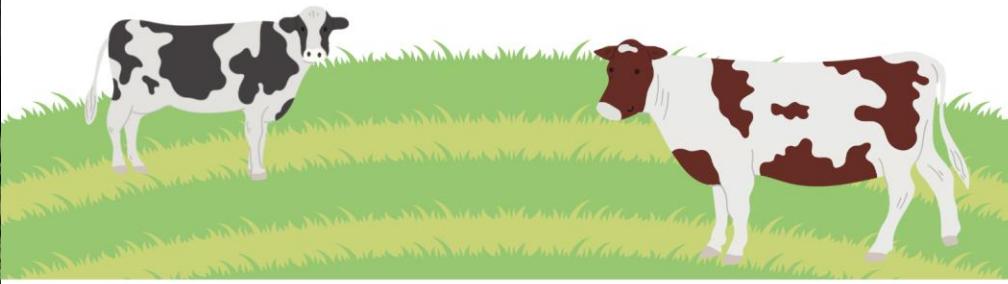
- Cattle can graze on land not suitable for growing crops
- Can be kept in tight herds using rotational, managed grazing with mobile fences, allowing grasses to recover
- Mimics what bison once did for the U.S. prairie

# Types of Livestock Grazing



## Continuous Grazing

Livestock graze freely in a large pasture, resulting in uneven pasture use



## Simple Rotational Grazing

Livestock are moved between a few smaller pastures, allowing for more pasture regrowth



## Management Intensive Rotational Grazing

Livestock are moved between many pastures, allowing for optimal pasture use and regrowth

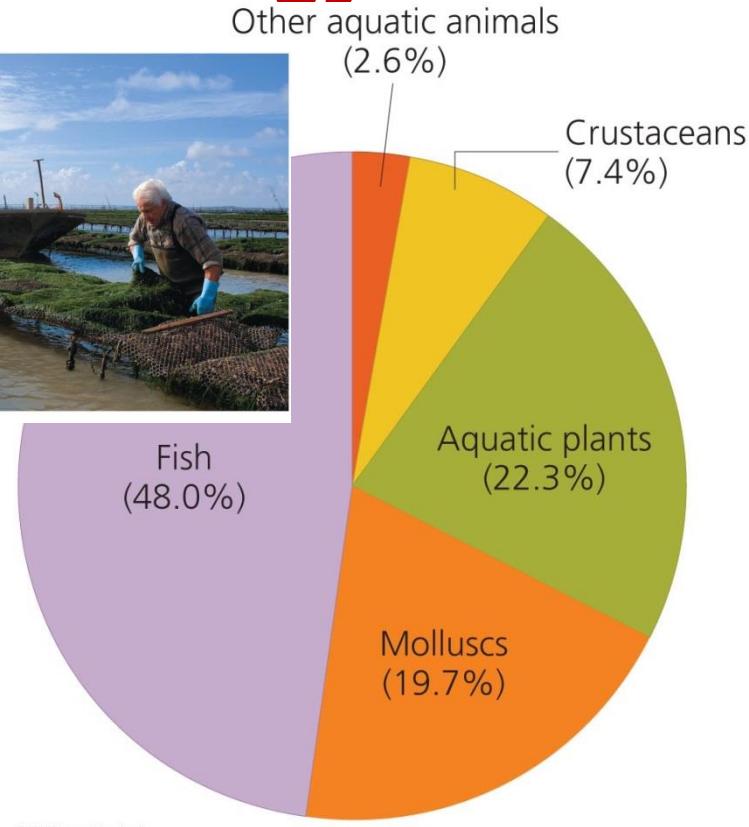


# Aquaculture is growing rapidly

## World wild fish populations are plummeting

- Due to improved fishing technology & increased demand

Farms now raise  
>220 freshwater  
& marine species  
in open-water or  
land-based pens



Provides  $\frac{3}{4}$  of world's fish,  $\frac{1}{2}$  of shellfish

Most widespread in Asia

# Aquaculture

## Benefits:

- A reliable protein source
- Can be sustainable
- Reduces pressure on overharvested wild fish
- Energy efficient: produces 10x more fish than wild harvest



## Drawbacks:

- Diseases results in antibiotics use
- Lots of waste (Much is released into ocean untreated)
- Uses grain & lots of wild fish as feed
- Escaped GM fish introduce disease or outcompete wild fish
- Habitat destruction shrimp farms destroy estuaries



# Improving Aquaculture

- **Away from sea: Raise fish & invertebrates in land-based salt water aquaria**

- No escaped fish or diseases into wild**

- Can clean & filter waste water**

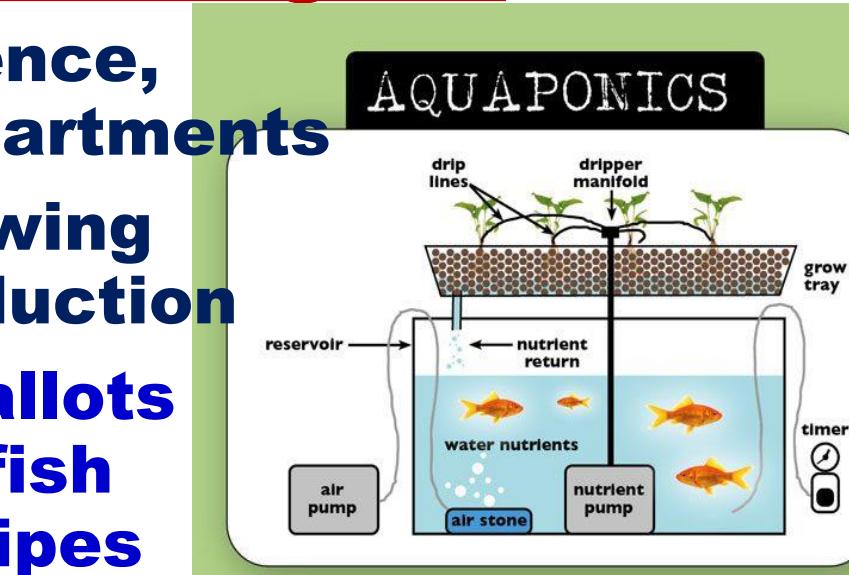
- Can locate near population centers: provide fresher, local seafood; reduces transportation costs; & greenhouse gas emissions**

- Can provide urban jobs & urban redevelopment**



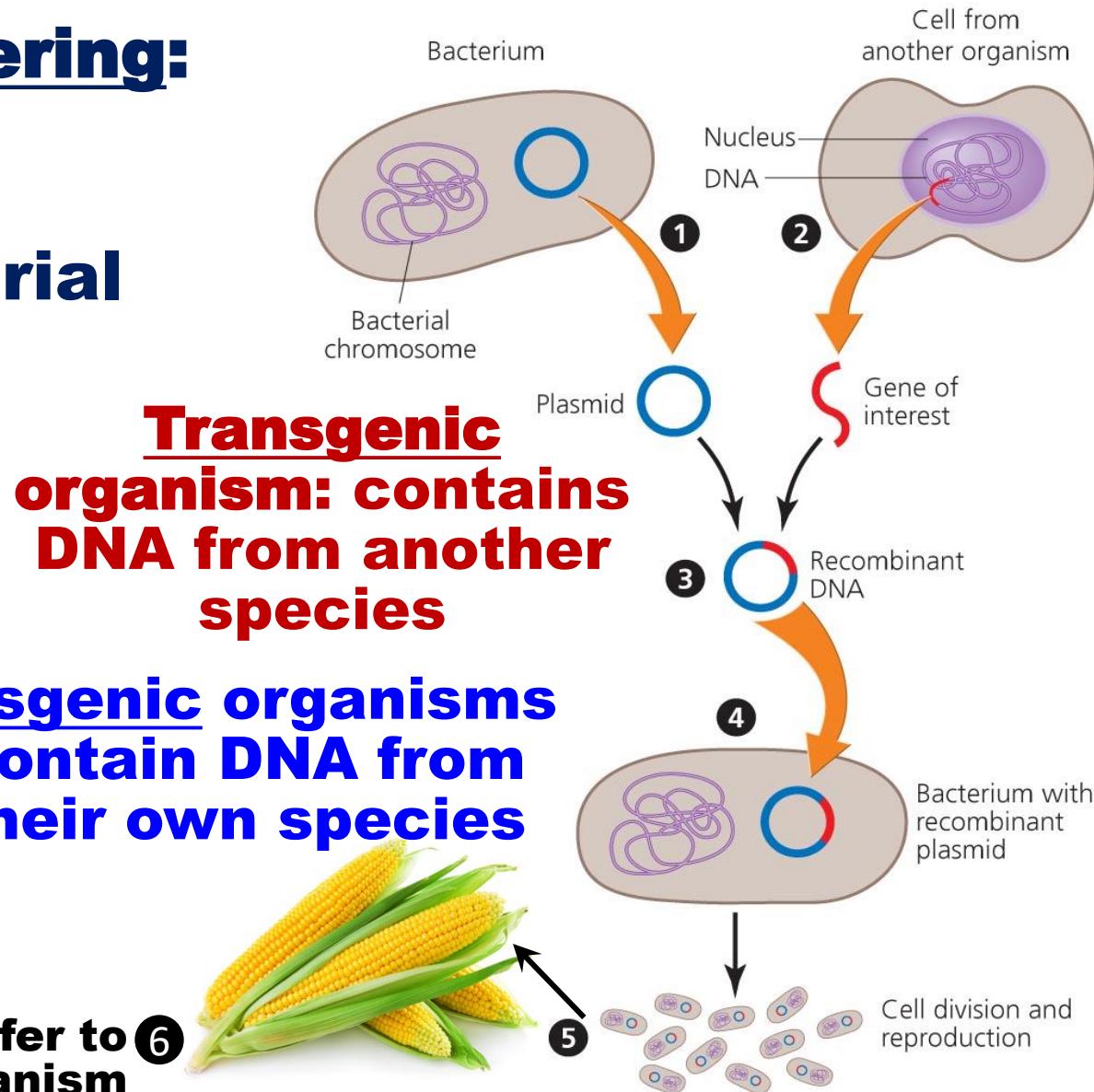
# OCC's Aquaponics Program

- Collaboration of Marine Science, Horticulture, & Culinary Departments
- Combines raising fish & growing plants in water for food production
- Students grow lettuce & shallots while raising Tilapia & Goldfish for use in Culinary Dept. recipes



# Genetically modified organisms (GM)

- Organisms that have been altered through:
- **Genetic engineering:**  
laboratory manipulation of genetic material
  - Add, delete, modify DNA
- Through use of Recombinant DNA (DNA created from multiple organisms)



# Genetic engineering vs. agricultural breeding

- **Traditional breeding:** changes organisms through artificial selection of the same or similar species
- Desirable traits selected in breeding animals or crops (high yield, tasty fruit, large size)
- Genes combined through normal reproduction
- **Genetic engineering:** uses technology to mix genes of different species (bacteria & corn), can be same species too
- Works with genetic material in labs
- Creates new combinations of genes some couldn't occur in nature (different species, Kingdoms)
- Resembles process of genetic mutation

Like natural selection



A salmon gene  
in a tomato  
keeps it from  
freezing

# Examples of genetically modified crops

- **Roundup ready corn & soy:** Most GM crops have been created to be herbicide (Roundup) resistant
  - Crops are not killed by roundup herbicide, so farmers can spray herbicide to kill weeds without killing crop
    - \*Problem – leads to pesticide resistant weeds
- **Grains that fix nitrogen like legumes:** crops modified to fix nitrogen from the atmosphere, so farmers don't need to apply fertilizer
  - Saves \$ & reduces pollution
- **Rice that is high in zinc & iron**
- **Bt Cotton:** engineered with genes from Bt bacterium, which kills insects, reduces pesticide use, increases yield
- **Crop plants that produce compounds to deter insect pests (no need for pesticides)**



# Improving Agriculture

- Industrial agriculture may seem necessary, but less-intensive methods are better for health, wildlife, controlling pollution & climate change
- Sustainable agriculture: does not deplete soil, pollute water, or decrease genetic diversity
- Low-input agriculture: uses smaller amounts of pesticide, fertilizers, growth hormones, water, & fossil fuels than industrial agriculture
- Organic agriculture: uses no synthetic fertilizers, insecticides, fungicides, herbicides, antibiotics, hormones, or GM crops
  - Relies on biological approaches (composting, biocontrol, polyculture, crop rotation, etc.)
- Reduce food waste: 25% of world's calories are lost before consumption (eat leftovers, gleaning)

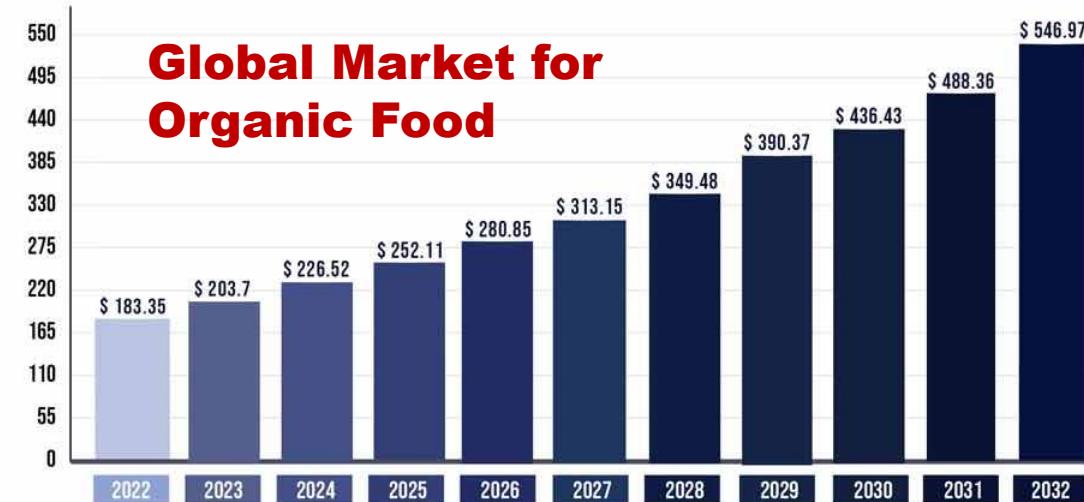
# Organic Farming

- Organic Food Production Act (1990) sets national standards for organic products
- USDA (U.S. Dept. of Agriculture) regulates organic food labeling & standards (2000)
  - Some states (CA, WA, TX, OR) have stricter label guidelines & ~500 organizations offer certification services

PRECEDENCE  
RESEARCH

ORGANIC FOOD MARKET SIZE 2022 TO 2032 (USD BILLION)

Global Market for  
Organic Food



Fastest growing sector  
of food business  
– USA 2024 sales  
were \$71.6 billion

# Benefits & Challenges of Organic Farming

- **Farmers have lower input costs (no expensive chemicals or GMO seeds), enhanced income, reduced chemical pollution, & soil degradation**
  - **Healthier for farm workers & their families (not exposed to toxic chemicals)**
  - **Practice stewardship of land**
  - **Costs of switching to new methods can be an obstacle**
    - Farms must be free of prohibited substances for 3 yrs. before labeling produce as organic
  - **Consumers are concerned about health risks of industrial agriculture & want to improve environmental quality**
    - **Obstacles include higher price of organics**





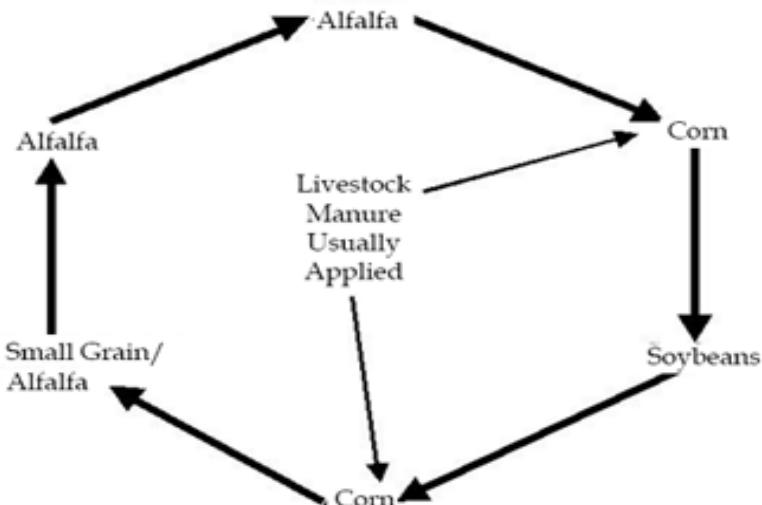
## Polyculture

Alternative methods to reduce pests & improve soil fertility

Figure 2.

### Field Crop Rotation

Corn Belt Model

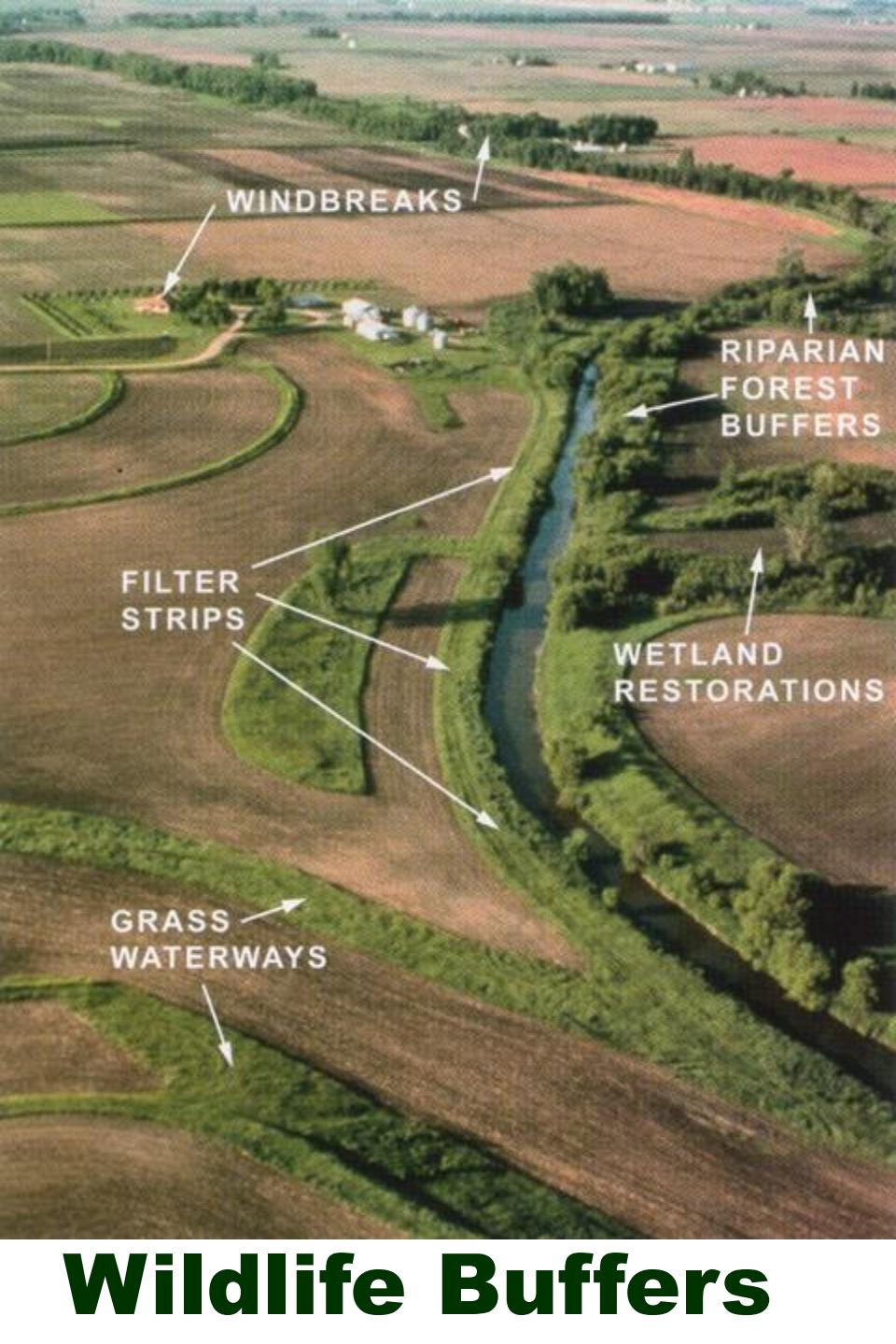


## Composting:



# Promote Biodiversity

## Pollinator-friendly flower strips



## Wildlife Buffers

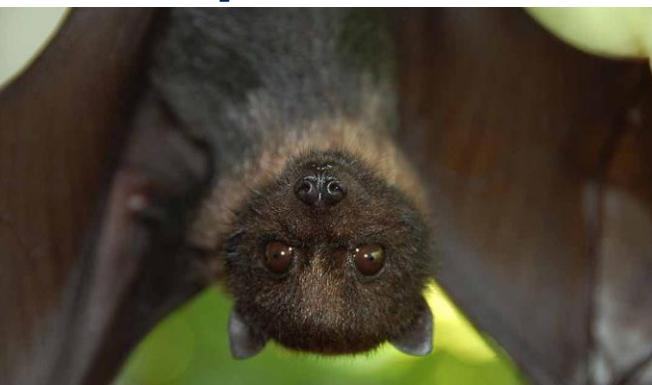
# Promote Farm-Friendly Biodiversity



**Hawks in the orchard  
...in the vineyard**



**Bats eat mosquitoes & other insect pests, help pollinate plants & disperse seeds**



**Birds of prey hunt rodents, insect pests, & avian pests that feed on fruit**



**Owl nesting boxes**



**Install bat roosting boxes to encourage bats onto farmland**

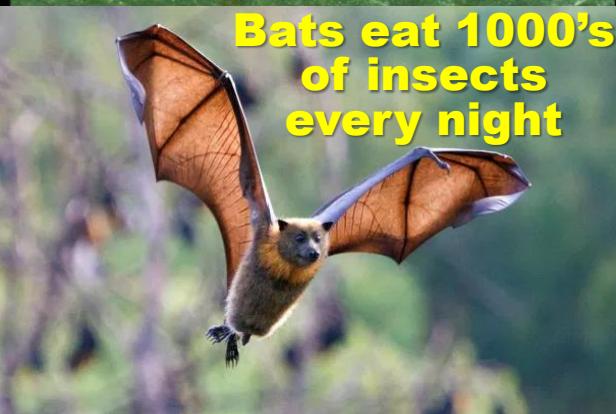
**Green Lace Wing  
feeds on insect  
pests**



**Ladybugs & feed on  
pest bugs like aphids!**



**Fake predators can  
work too**



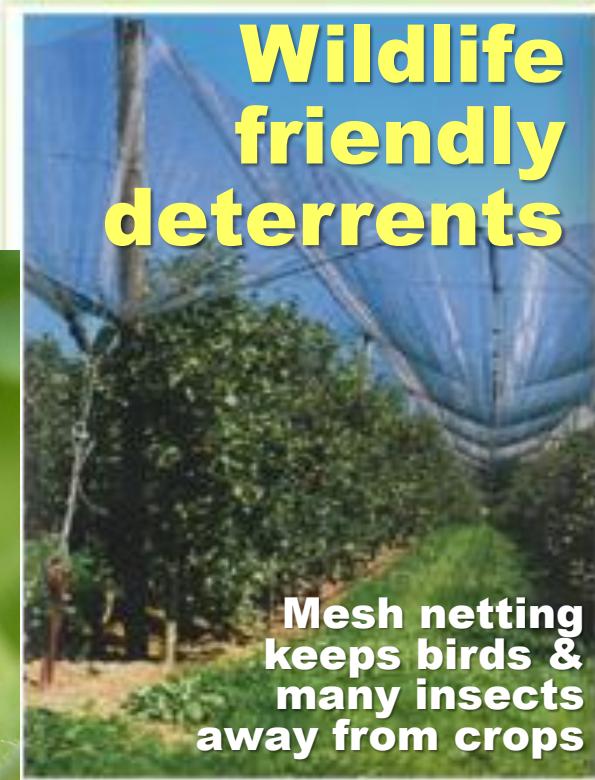
**Bats eat 1000's  
of insects  
every night**

## **Natural Predators & Pollinators**



**Bees &  
Butterflies pollinate  
our crops for free**

**Wildlife  
friendly  
deterrents**



**Mesh netting  
keeps birds &  
many insects  
away from crops**

# Locally Supported Agriculture

- Buying seasonal, local, sustainable agriculture reduces fossil fuel use from long-distance transport of products, can be healthier since it is fresh
  - Food transported long distances is chemically treated for freshness & color, can be lower in nutrients, which are lost due to long time between picking & eating
- Farmers' markets provide fresh, locally grown food
- Community-supported agriculture (CSA)
  - Consumers pay local farmers in advance & farmers get guaranteed income
  - Consumers get fresh food





## **The Ron Finley Project “The Gangsta Gardener”**

**<https://youtu.be/x8rhAbX45Cg>**

**If you can't click, copy & paste in your browser to watch**

# **The Ron Finley Project “The Gangsta Gardener”**

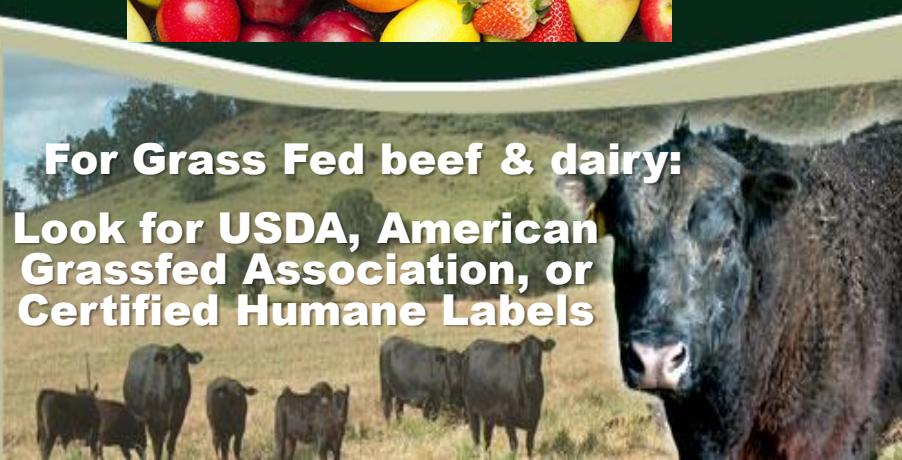
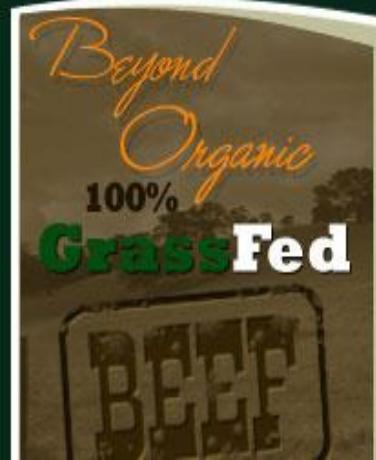
**[https://youtu.be/EzZzZ\\_qpZ4w](https://youtu.be/EzZzZ_qpZ4w)**

**“Kids learn what they live. If a kid grows kale, a kid eats kale.”**



# **Food for thought.....**

# **You are what you eat & you are what your food eats!!**



**Want to learn more?**

**Books by Michael Pollan:**

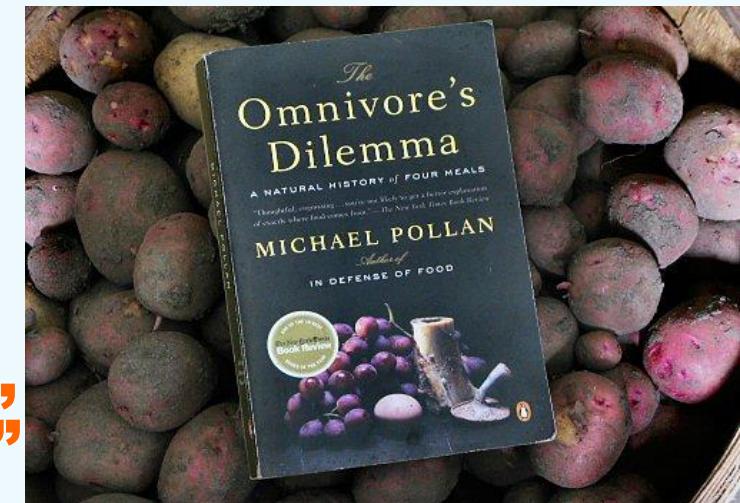
**The Omnivore's Dilemma**

**Food Rules, an Eater's Manual**

**“Don’t eat anything your great-grandmother  
would not  
recognize  
as food”**

**“Eat food,  
not too much,  
mostly plants”**

*Cooked on Netflix  
By Michael Pollan*



**Environmental Working Group <http://www.ewg.org>**

**Tanaka Farms CSA, u-pick, farmstand**

**<https://www.tanakafarms.com/>**

**South Coast Farms CSA, u-pick, farmstand**

**<http://southcoastfarms.com/>**

# Want to learn more?

## Imperfect Foods & Misfits Market

<https://www.imperfectfoods.com/>

<https://www.misfitsmarket.com/>

- These companies' mission is to eliminate food waste & build a better food system for everyone:
  - Reduce food waste on the farm, at the store, & in the home
  - “If food can be saved, we will save it. With every bite into a misshapen apple, short piece of pasta, or oversized egg we can shape our world for the better.”

