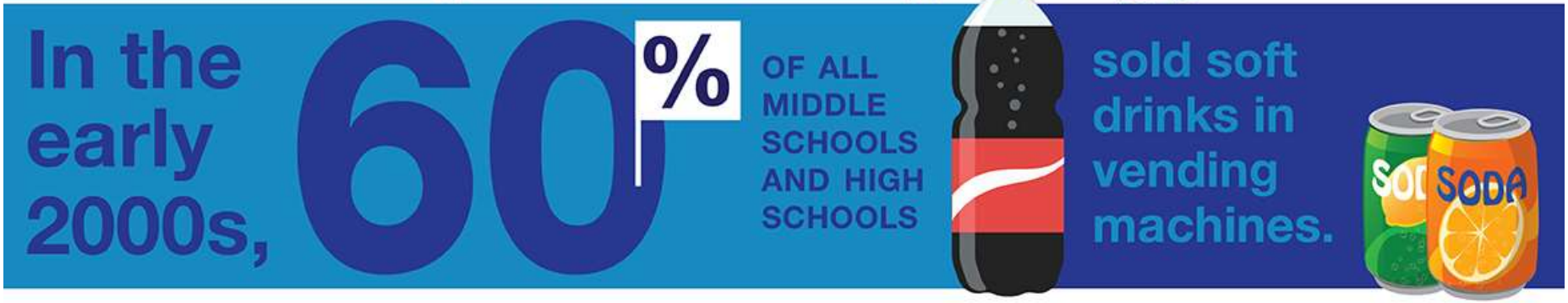

"The American diet is designed and engineered for a shelf in a warehouse, not for the American gut."
UNV
Real Food

Standard American Diet

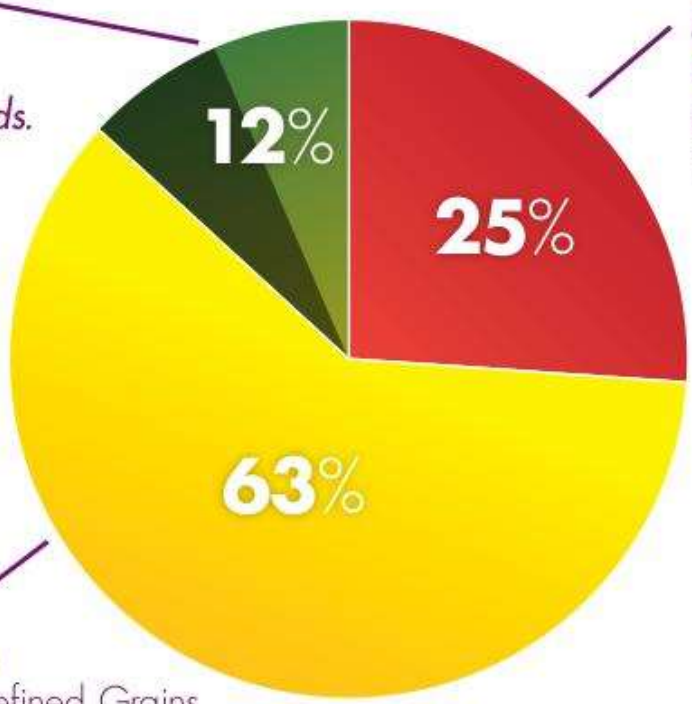


Standard American Diet

U.S. FOOD CONSUMPTION
AS A % OF CALORIES

PLANT FOOD:
Vegetables, Fruits, Legumes, Nuts & Seeds, Whole Grains
***Fiber** is only found in plant foods.*

NOTE: Up to half of this category may be processed, for example almonds in candy bars, apples in apple pies or spinach in frozen spinach soufflé, and of course these would not be healthy choices. The focus should be on whole unprocessed vegetables, fruits, legumes, nuts and seeds and whole grains.



PROCESSED FOOD:
Added Fats & Oils, Sugars, Refined Grains

ANIMAL FOOD:
Meat, Dairy, Eggs, Fish, Seafood
***Cholesterol** is only found in animal foods. Animal foods are the PRIMARY source of saturated fat.*

GUIDE TO HEALTHY EATING:
Much easier to understand than the USDA Food Pyramid, with no food industry influence.

Eat **LESS** from the animal and processed food groups and **MORE** whole foods from the plant food group.

In general, food from the animal and processed food group contribute to disease, while **WHOLE** foods from the plant group contribute to good health.

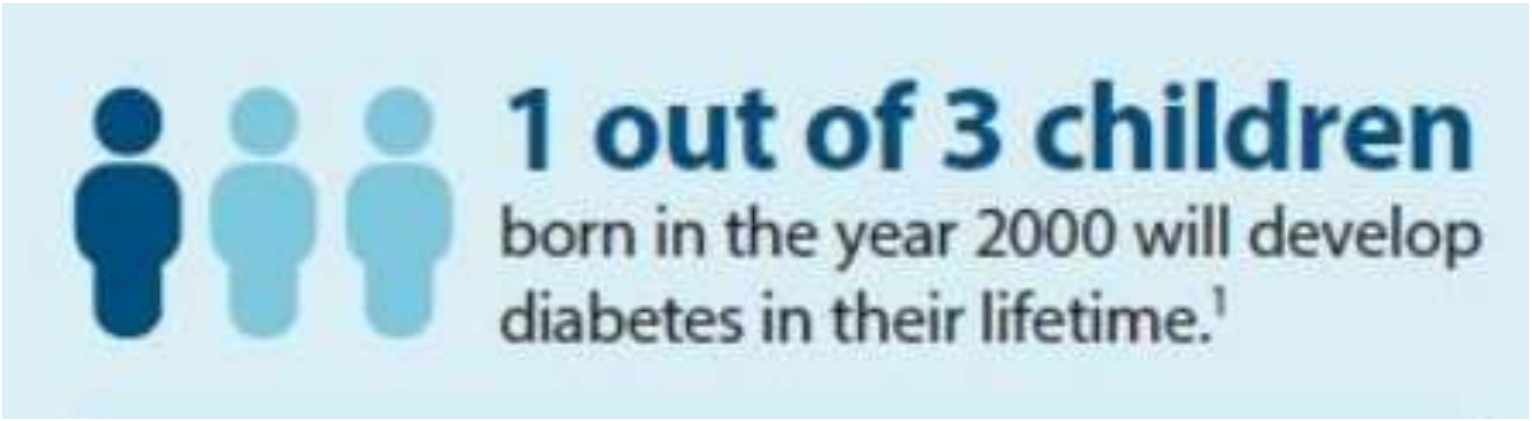
Source: USDA Economic Research Service, 2009; www.ers.usda.gov/publications/EIB33; www.ers.usda.gov/Data/FoodConsumption/FoodGuideIndex.htm#calories
New York Coalition for Healthy School Food * www.healthyschoolfood.org
Special thanks to Joel Fuhrman, MD, author of *Disease Proof Your Child: Feeding Kids Right* * Graphics by MichelleBando.com

Health impacts of the Standard American Diet

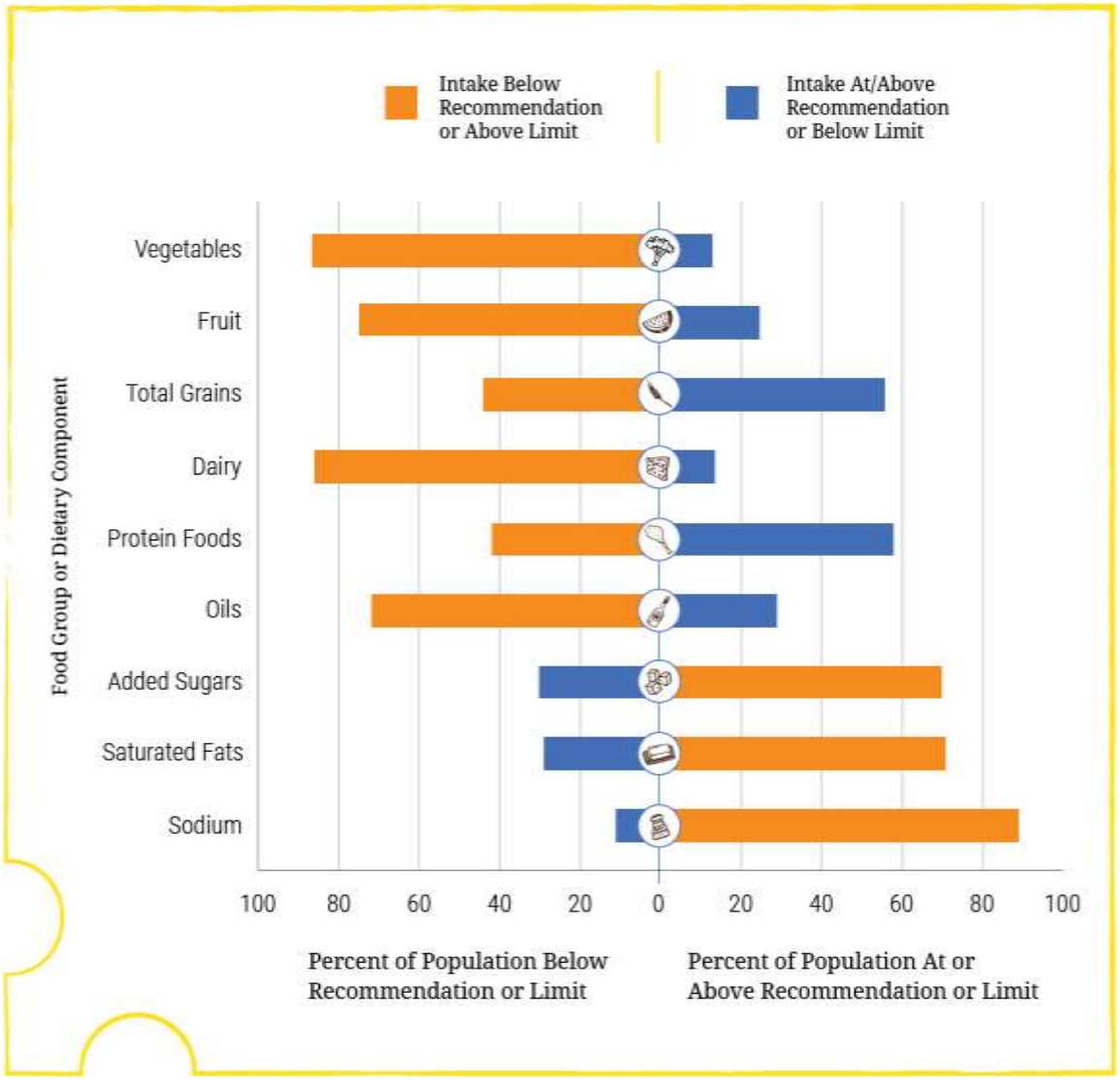
- Approximately 70% of Americans are overweight or obese

Sex, age, race and Hispanic origin [1], and percent of poverty level	Overweight or obese (BMI greater than or equal to 25.0) [2]				
	1988–1994	1999–2002	2003–2006	2007–2010	2011–2014
20 years and over, age-adjusted [3]			Percent of population		
Both sexes [4]	56.0	65.1	66.7	68.5	69.5

http://www.cdc.gov/nchs/fastats/obesity-overweight.htm


1 out of 3 children
born in the year 2000 will develop
diabetes in their lifetime.[1]

Dietary shifts needed to align with healthy eating guidelines



https://health.gov/dietaryguidelines/2015/guidelines/message/

SURGEON GENERAL'S

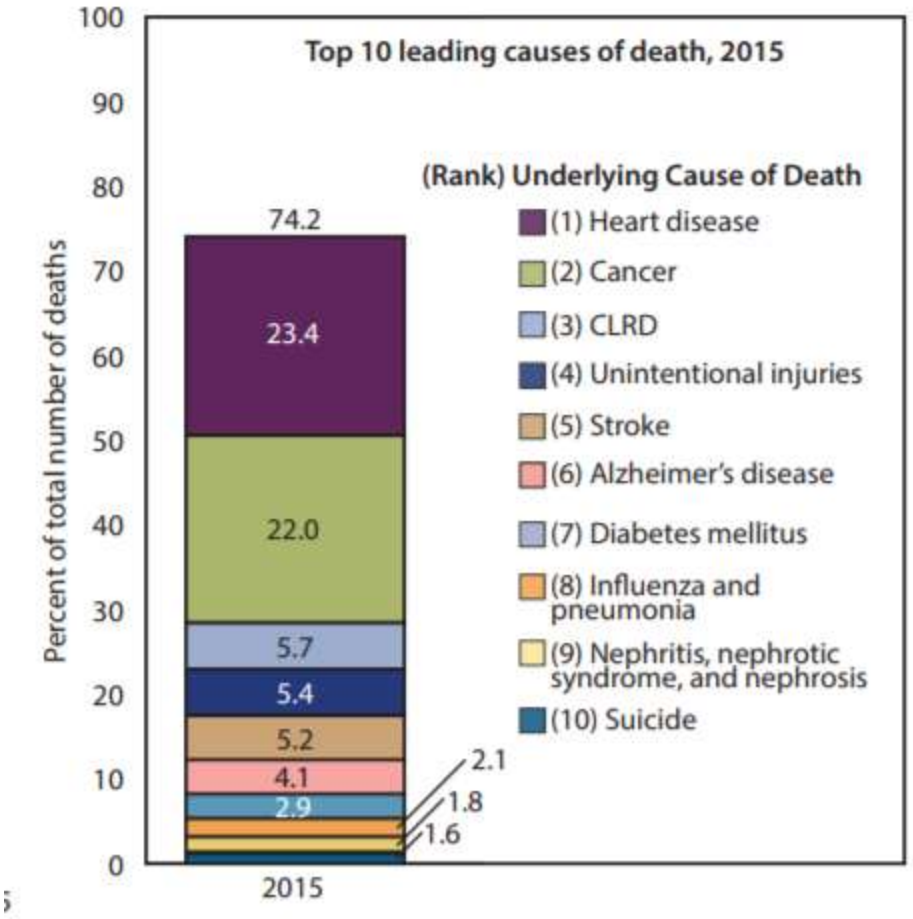
WARNING:

The Standard American Diet causes approximately two-thirds of the deaths due to disease in America.

~ 60% deaths in the US are diet related

Diet related diseases include:

- Heart disease
- Cancer
- Stroke
- Diabetes



Cancer and sugar

“Today, about half of all American adults—117 million people—have one or more preventable, chronic diseases, many of which are related to poor quality eating patterns..”

https://health.gov/dietaryguidelines/2015/guidelines/executive-summary/

Autoimmune Disorders and Diet

Table 1

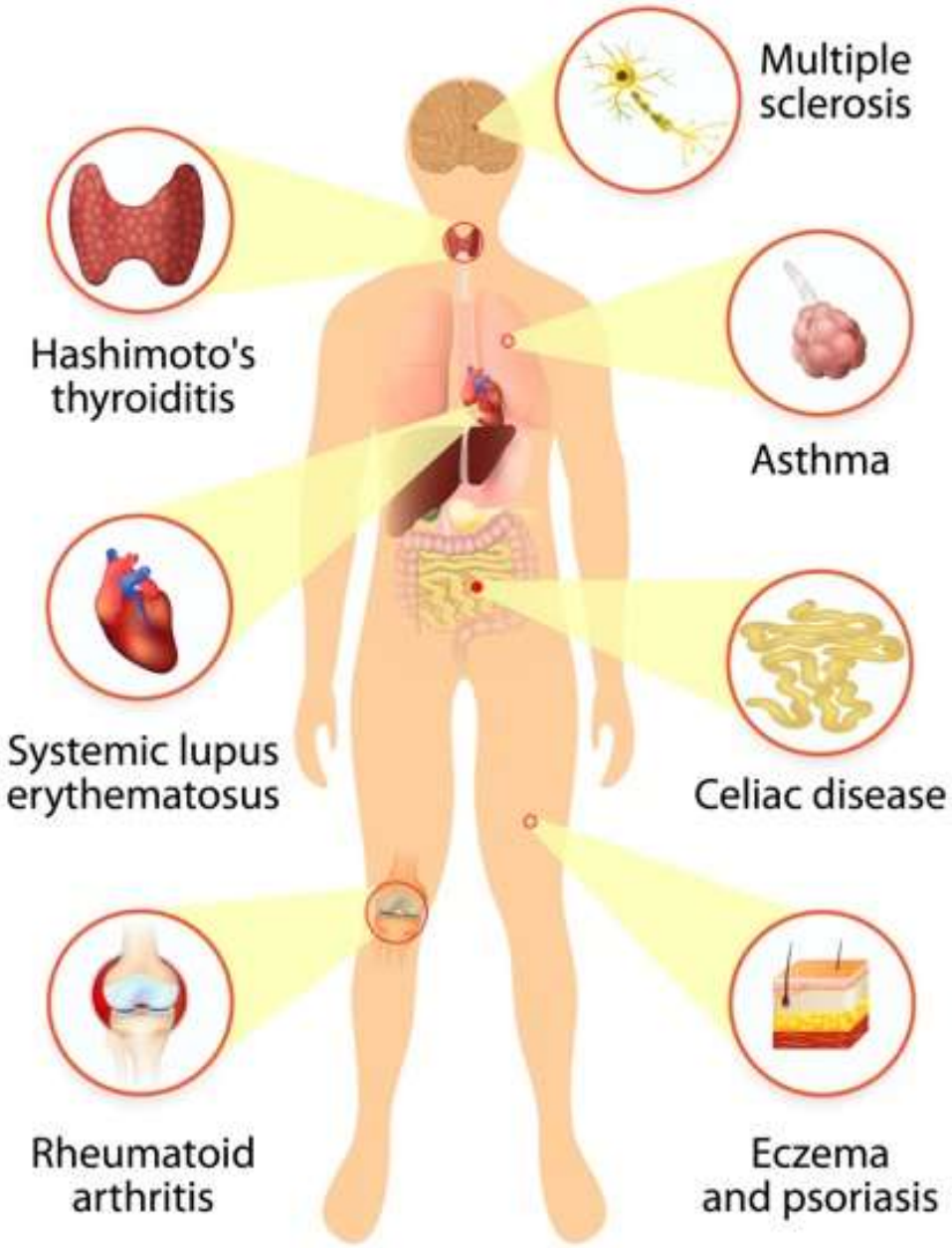
Studies testing dietary interventions in models of autoimmune diseases

Dietary factor	Disease model	Ref.	Overall effect	Putative mechanisms
Calorie restriction	EAE	[56]	Beneficial	Curtailment of leptin
Calorie restriction	EAE	[95]	Beneficial	Curtailment of leptin
PUFA	EAE	[96]	Beneficial	PPAR-γ induction
Olive oil and polyphenols	DIC	[97]	Beneficial	PPAR-γ induction
Fish-oil	CIA	[98]	Beneficial	Macrophage function
Green tea extract	EAE	[99]	Beneficial	NFκB inhibition
High-fat diet	IBD	[50]	Detrimental	Unknown
High-fat diet	CIA	[51]	Detrimental	T_H17 induction
High-fat diet	EAE, TNBS Colitis	[44]	Detrimental	T_H17 induction
High-salt diet	EAE	[74]	Detrimental	T_H17 induction
High-salt diet	EAE	[73]	Detrimental	T_H17 induction
Trans fatty acids	DIC	[100]	Detrimental	T_H17 induction

EAE Experimental autoimmune encephalomyelitis, *CIA* collagen-induced arthritis, *DIC* DSS-induced colitis.

Manzel, Arndt et al. “Role of ‘Western Diet’ in Inflammatory Autoimmune Diseases.” *Current allergy and asthma reports* 14.1 (2014): 404. *PMC*. Web. 5 Jan. 2018.

AUTOIMMUNE DISEASES



Life Expectancy by Country 2017 census data

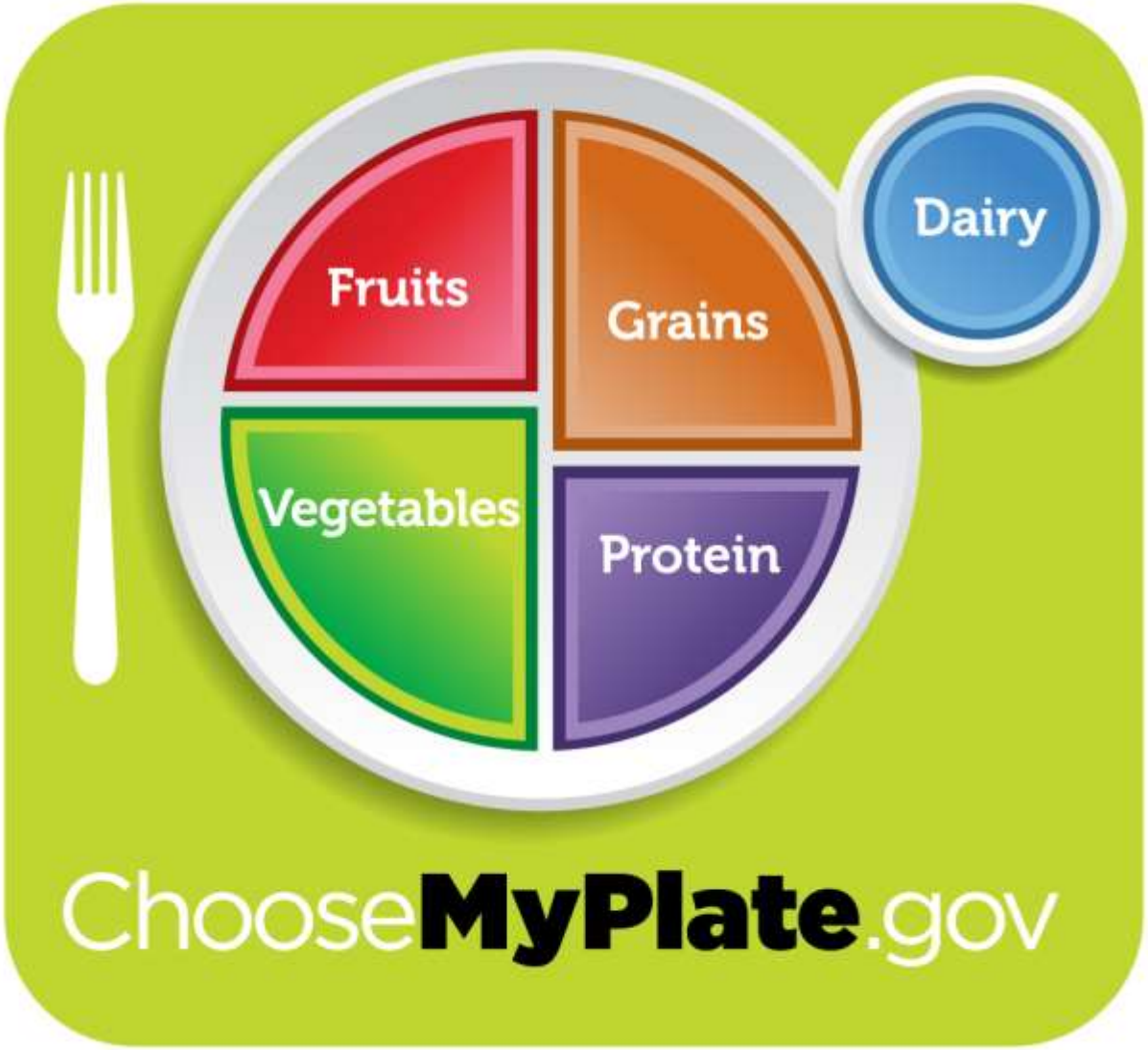
- US = 78.5
- Costa Rica = 80.5
- Finland = 81
- Canada, Ireland = 81.5
- France, New Zealand, Israel, Sweden, Norway = 82
- Hong Kong(China), Italy and Japan = 84

Costa Rica

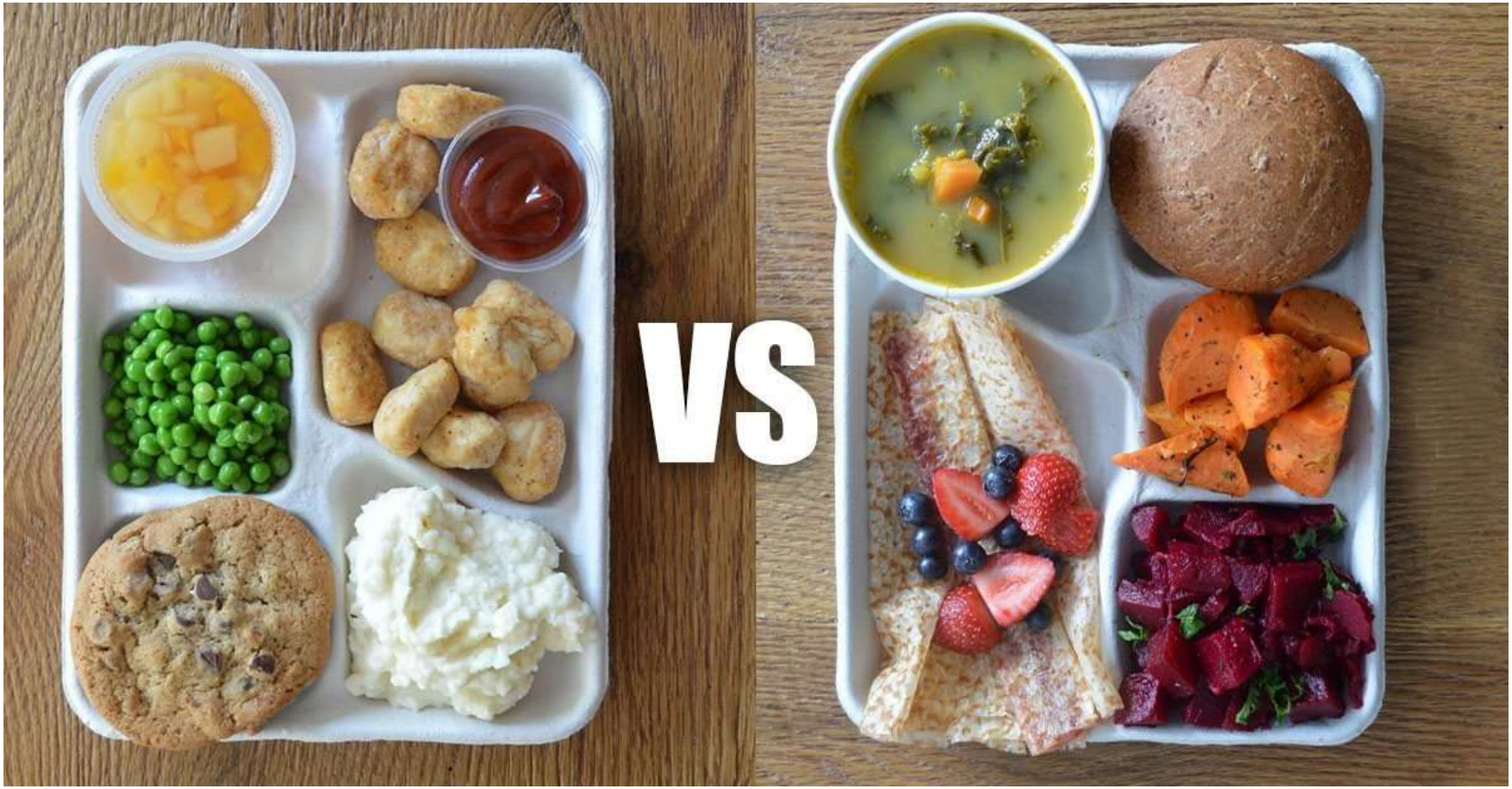
Youth Climate Team in Finland

Healthy diets = whole foods diet

2010 USDA Guidelines



School Lunches



Curing MS and other chronic diseases with diet

3 cups green leaves daily

- Ex: Kale, spinach, lettuce
- Provide vitamins B, A, C and potassium
- Note Kale = most nutritious

3 cups Sulfur Rich Vegetables

- Ex: cabbage, broccoli, turnips, rutabagas, onions, garlic, mushrooms, asparagus
- Needed for mitochondrial health → MORE ENERGY

3 Cups Colors

- Carrots, beets, red peppers
- Raspberries, strawberries, blueberries
- Lots of vitamins and antioxidants (prevent cell damage associated with cancer)

High Quality Proteins

- Ex: <u>Salmon, herring, grass fed meat</u>
- Omega 3 fatty acids needed for brain tissue development

Dan Coffrin LPHS student

Whole Grains

- Whole grain wheat, barley, brown rice, oats, rye, amaranth, quinoa
- Complex carbohydrates and fiber → aids in digestion , decreases heart disease and diabetes

Inuit Diet= Whole Foods Diet
Elijah and Naomi


MERCURY
MERCURY

Hunter/Gatherer and Whole Foods Diets

- Advantages
  - More nutritious
  - More sustainable

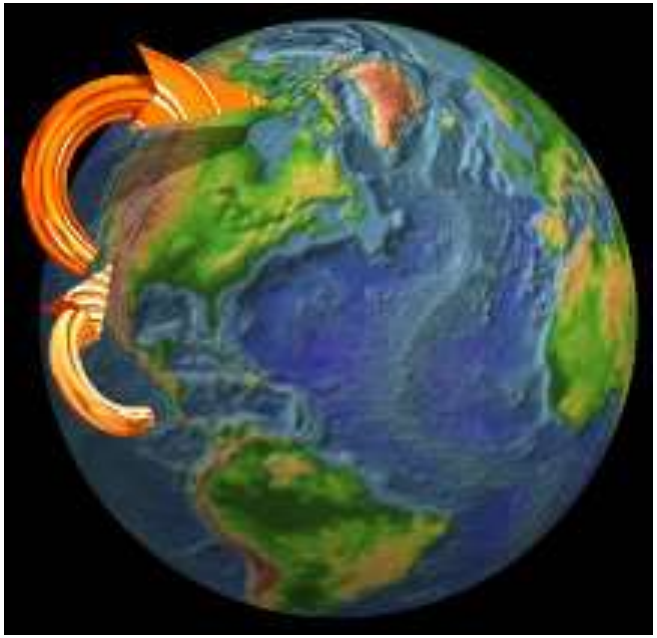
Human impacts on hunter/gatherer lifestyles

- Climate change → habitat loss → species extinctions

- Biomagnification = toxins build up in food chains (ex: PCBs, DDT, mercury, lead…)

Global distillation effect

- pollutants concentrate in colder regions
- colder climates → more deposition



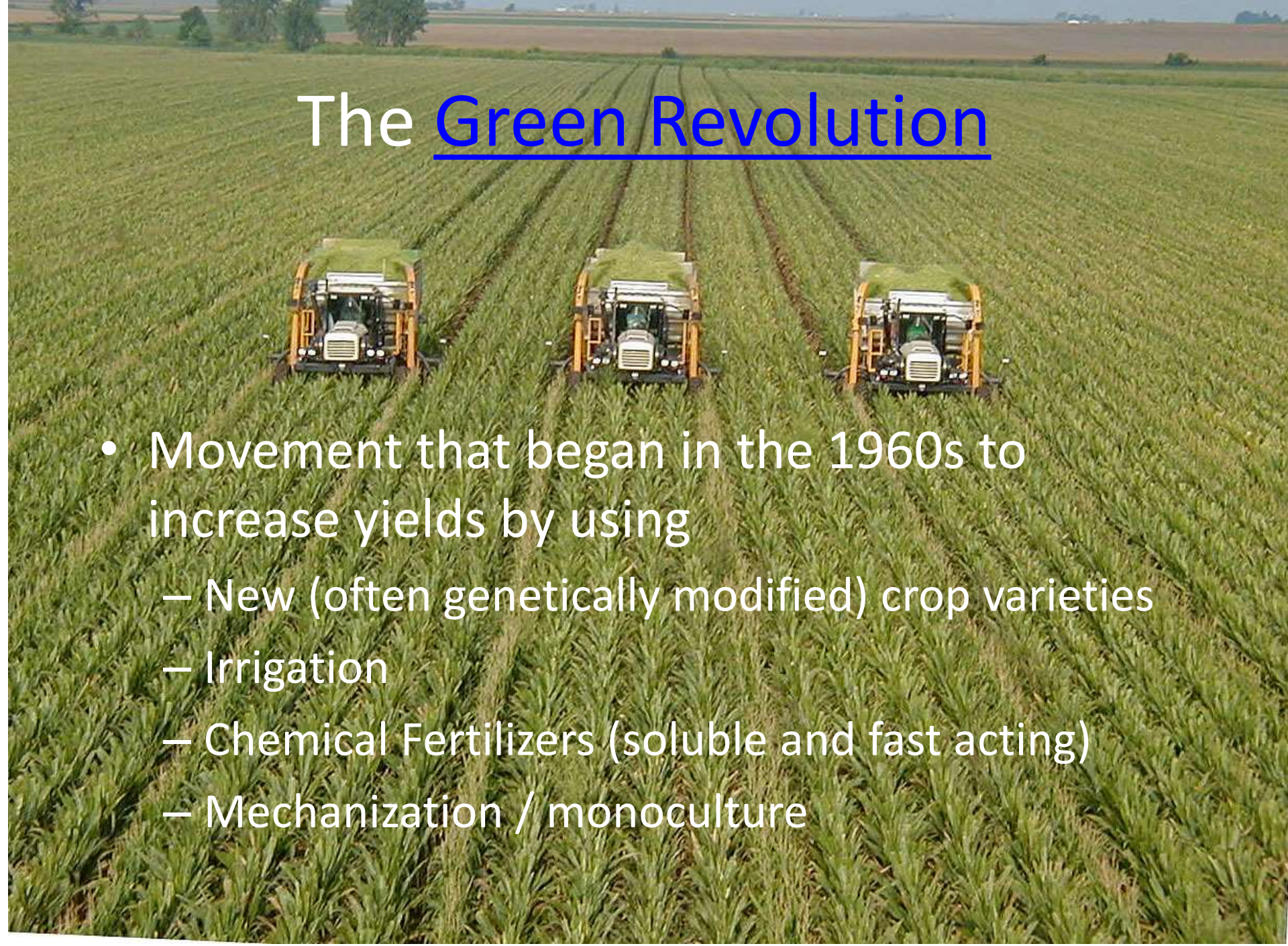
Big Mac = $3.99
extra value meal $5.49

1 head of organic broccoli = $3.49

Why is it more expensive to eat a whole foods diet?

- Farmers can't compete with industrial agriculture
  - Subsidies go to factory farms
  - Green revolution

The Green Revolution



- Movement that began in the 1960s to increase yields by using
  - New (often genetically modified) crop varieties
  - Irrigation
  - Chemical Fertilizers (soluble and fast acting)
  - Mechanization / monoculture

Good Results

- Food production increased over 1000% from 1960 – 1990
- Famine decreased 20%
- Per capita calorie consumption increased
- Cheap food → rise in incomes and standard of living

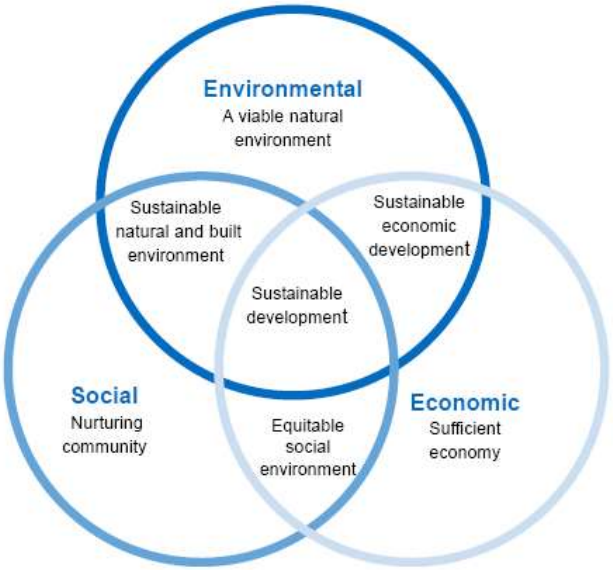
How???

- Chemical fertilizers
- Chemical pesticides
- Genetically modified crops (corn and soybean)
- Mechanization (factory farming)
- Antibiotics and hormones in animal feed

Industrial farms vs Organic farming

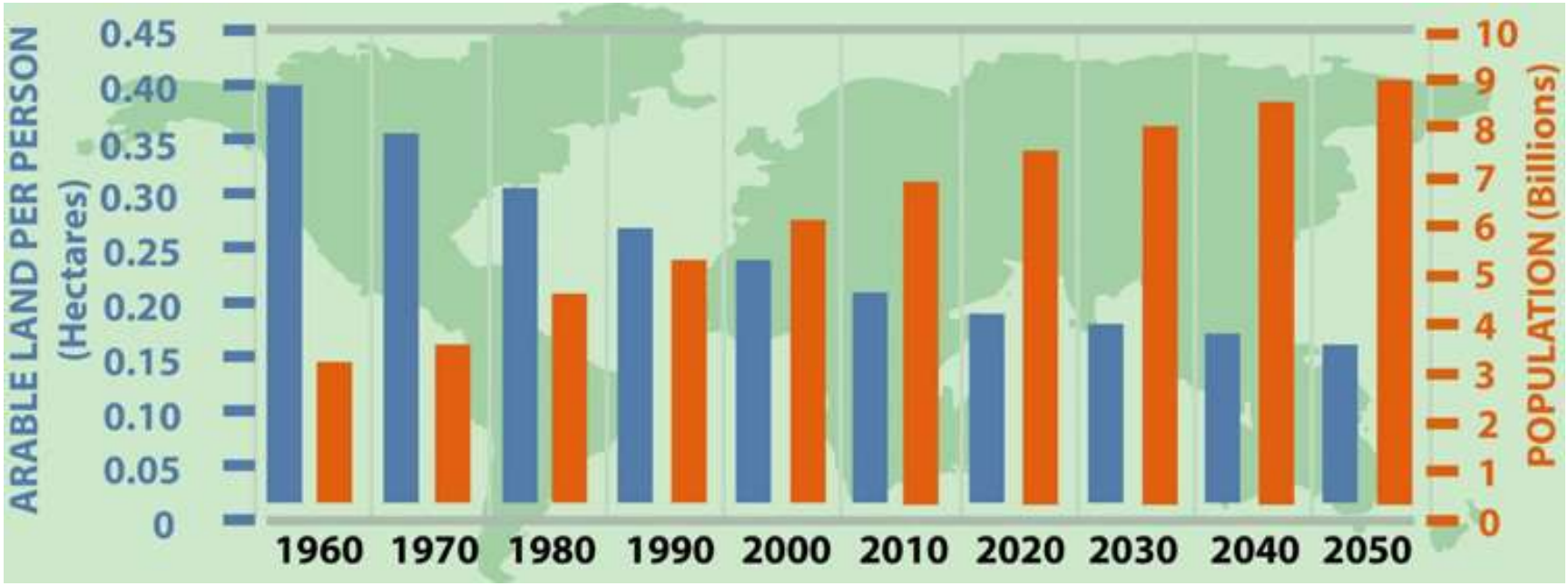
Define Sustainable

- <u>Meets the needs of the present without depleting resources for future generations</u>



Why is the industrial food system unsustainable?

Population still rising and there is not enough arable land



The future of food will have to be creative

Green Revolution = environmentally unsustainable

- Environmental problems
  - Requires fossil fuels → depletes a nonrenewable resource
  - Irrigation → aquifer depletion
  - Pesticide use → increased resistance
  - Fertilizer use → eutrophication
  - Monocultures → Loss of topsoil and loss of soil nutrients
  - Loss of variety in seed stocks → loss of biodiversity

Green Revolution = economically unsustainable

- High costs of production
  - Fossil fuels
  - Pesticide treadmill (more you use the more you need)
  - Fertilizers
  - GMO seeds are expensive

  - All require huge subsidies

Why does it cost more to buy a head of broccoli from an organic farm than it does to buy a can of soda made from corn syrup from the industrial farm system???

Government Subsidies

- US (taxpayers) pay ~ $20 billion per year to farms to keep food prices down.
- Most of that goes to commodity crops (corn, soybeans, wheat)
- 72% goes to huge industrial farms owned by large companies leaving very little for the smaller sustainable farms

http://www.washingtonpost.com/wp-dyn/content/graphic/2006/07/02/GR2006070200024.html

http://farm.ewg.org/

Describe Sustainable Farms

- Growing a variety of crops → better soil
- Letting animals graze naturally → healthier animals and less water pollution
- Fertilize with compost → builds better soil
- Rotating crops → healthier plants fewer pests
- Use natural predators (ex: plant shrubs and trees → birds to eat insects)

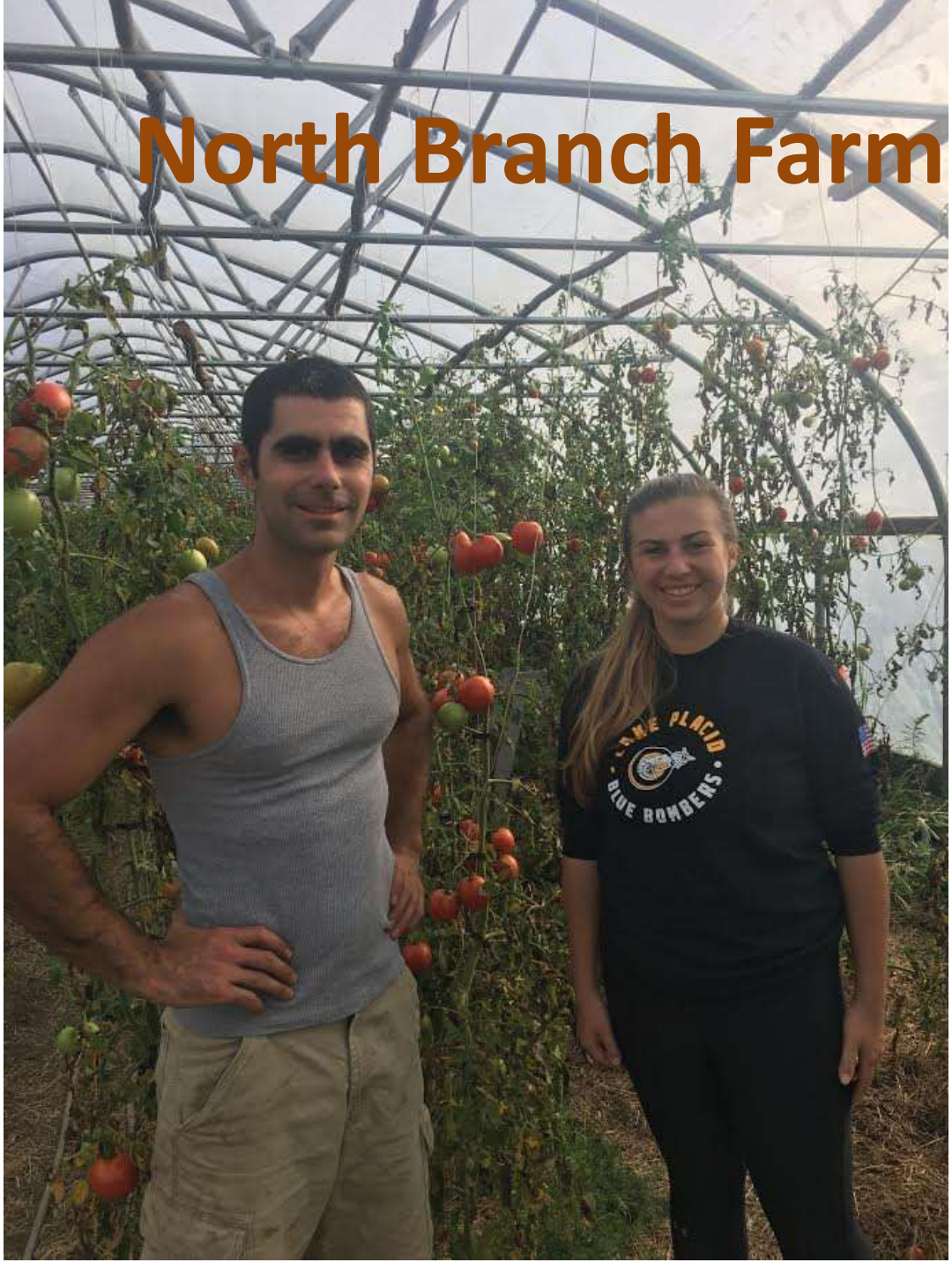
Fossil fuels used to → food

- Ex:
  - Tractors, fertilizer and pesticide production, transportation, processing
- Env. problems with using fossil fuels
  - Deplete nonrenewable resources
  - Release CO_2 → global warming → rising sea levels and changing climates
  - Release NOx & SOx → acid rain → kills fish and trees
  - Smoke particles → smog → resp. problems and decreased photosynthesis
- Alternatives
  - Local foods
  - Eat non processed/whole foods
  - CSA (community supported agriculture)
  - USDA certified organic

Essex farm

Fledging Crow Farm

North Branch Farm



Harmony Hills Farmstead

Half Share = $110/month

- Category A = 5 packages: Ground Beef, Ground Pork, Ground Beef Patties (3/pack), Sweet Italian Sausage Links, Sweet Italian Sausage Bulk, Spicy Italian Sausage Links, Spicy Italian Sausage Bulk, Breakfast Sausage Links, Breakfast Sausage Bulk, Hickory Smoked Kielbasa, Frankfurter (hot dogs), Pint of Lard, Bar of Soap, Poultry Spice Rub.
- AND
- Category B = 2 packages: Center Cut Pork Chops, Hickory Smoked Pork Chops, Side Pork (sliced), Pork Tenderloin, Pork Cutlets, Pork Stew, Beef Stew, Beef Rib Steak, Top Sirloin Steak, Beef Sandwich Steak, Bone-In NYS Steak, Hickory Smoked Bacon, Hickory Smoked Canadian Bacon, Hickory Smoked Ham Steaks, Summer Sausage.
- AND
- Category C =1 package: Pork Loin Roast, Pork Shoulder Roast, Fresh Pork Hocks, Hickory Smoked Pork Hocks, Hickory Smoked Ham Roast, Fresh Ham Roast, Pork Spare Ribs, Pork Country Style Ribs, Pork Baby-Back Ribs, Beef Chuck Roast, Top Round (London Broil), Osso Bucco, Beef Short Ribs.
- AND
- Category D = Whole Chicken OR 3 Packages from Category A OR 4 Packs of Ground Beef
- AND
- Category E = 1 Dozen Eggs OR 1 Soap OR 1 Package from Category A
-
- SOAP: Oats & Honey (ground up vanilla bean inside), Winter Spice (Cinnamon-Clove-Sweet Orange), Garden Mint, Lavender, Lemongrass & Tea Tree (most popular), Grapefruit Poppy Seed, Cedarwood/Tea Tree (smells like a forest), Evergreen (Pine Tar with/Fir Needle Essential Oil), Soothing Evergreen (Pine Tar w/ Lavender Essential Oil) , Baby Unscented, and Baby Creamy Carrot (great for sensitive skin types).

Chemical fertilizers

- Environmental problems
  - Runoff into streams → eutrophication
  - Liquid fertilizers in arid regions → soil salination→
  - dec plant production
- Alternatives
  - Compost
  - Rotating crops
  - USDA certified organic crops

5lbs food waste : 1 lb wood pellets

214 lbs / week =
8,560 lbs / yr

Not going to a landfill

Pesticides

- Ex: insecticides kill insects, herbicides kill plants
- Environmental problems
  - Kill non target species
  - Can build up in food chains (bioaccumulate)
- Alternatives
  - Natural predators (like ladybugs and birds)
  - Use phermone traps
  - Plant a diversity of crops → stability
  - USDA certified organic

Bee Bummer

https://www.ted.com/talks/marla_spivak_why_bees_are_disappearing

CAFO's Concentrated Animal Feeding Operations

- Environmental problems
  - Density dependent limiting factors
    - Disease (→ increase in food born illnesses therefore requires antibiotics and other medicines)
    - Feeding (requires large amount of cheap grain crops)
- Creates concentrated organic pollution – lagoons full of manure → eutrophication
- Alternative =
  - Purchase free range or grass fed meat
  - By from local csa farms
  - Purchase USDA certified organic meat

Industrial farm in North Carolina
50lbs → 300lbs in 4 months = mostly fat

- Diet =
  - **Weaned at 20 days then fed primarily corn and soy**
  - Farmer has a contract with Smithfield and is required to buy all food from them

Manure lagoons can leak and overflow

Harmony Hill Farms outside Malone

- Diet = mixture of pigs milk, native plants and grasses, fruits and vegetables with some grains → more complete proteins

Alternatives

- Local
- Grass fed
- Organic

Manure goes to anaerobic digester → pig power and liquid digestate sprayed on fields → runoff

Read grass fed beef vs grain fed beef article in notes

- Grass fed =
  - Healthier animals,
  - less fat,
  - more vitamans and minerals,
  - good source of omega 3 fatty acids

Controversial practices/issues

Hormone Debate

- Hormones
  - Can increase milk production and
  - → more meat / animal
- Environmental impact:
  - May cause cancer,
  - effect growth and development of young children
  - Due to traces of hormones in US cattle European Union countries do not buy
    - Ex: BST in milk may effect humans (according to FDA = safe but EU worried about increased breast cancer)
  - Some hormones in ecosystems do effect wildlife
    - Ex: Estrogen (active ingredient in most oral contraceptives) often finds it way into surface waters through sewer systems → effects fish
    - Endocrine disruptors = chemicals that disrupt hormones
- Alternatives
  - USDA certified organic meat = hormone free

http://www.winchestercheese.com/cheesemaking/pix/milking.jpg

Antibiotic debate

- Adding antiobiotics to animal feed → 4-5% increased weight
- → natural selection of antibiotic resistant strains of bacteria
  - Ex: antibiotic resistant strains of E.coli
  - Ex: MRSA = multi-drug resistant strains of staphlococcus aureus

Alternatives:

- In 1999 the EU banned US beef that had been treated with antibiotics
- Organic certified meat does not contain antibiotics

MRSA

Multi drug resistant staph infection

Spider bite or bacterial infection??

Case study

- Patient went to emergency room in Buffalo
- They looked at it → antibiotic
- 10 days looked worse didn't get better
- Went to Dr.'s office (looked at it and said spider bite)
- Drained it and gave different antibiotics just in case
- Got better
- What was it??????????????????????????????

1 Month later

- Another infection in a different location
- THIS TIME DR took a sample of the pus and sent to lab
- LAB → MRSA

How did MRSA become antibiotic resistant

- Mutations → variations into bacterial populations
- Plasmid transfer → increase in resistant genes in bacterial populations
- Overuse of antibiotics selects resistant strains
- Strains that are resistant survive and reproduce
- Next generation of bacteria are resistant

Why study evolution

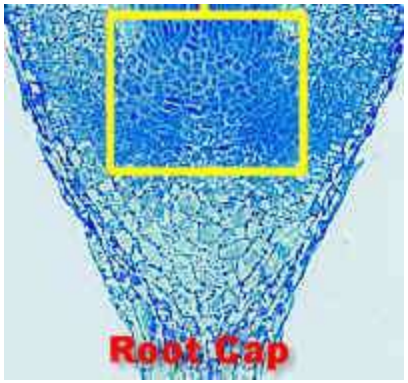
- Helps us make better choices
- Need to stop using antibiotics in animal feed, hand sanitizers…

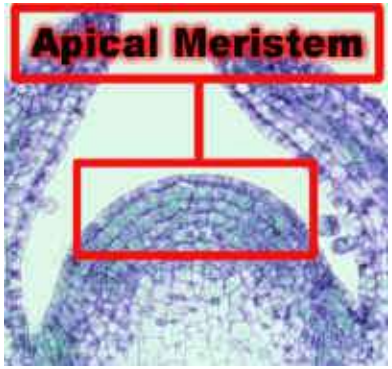
Chemicals that disrupt hormone signaling

- Endocrine disruptors
- Ex:
- BPA (plastics)
- Pthalates (plastics)
- PCBs (industrial chemicals)
- DDT (insecticides)
- Dioxins (found in herbicides)

Agriculture → decreased genetic diversity
Monoculture → loss of diversity

- Wild-type plants and animals = high diversity
- Domesticated = lower genetic diversity
- Heirloom varieties → more diversity
- Diversity → stability
- Efforts are being made to maintain traditional varieties that have evolved to be suited to local regions
- Germplasm is plant material that can be used in breeding
  - Note meristematic tissues =(rapidly growing parts of plants)





Genetic Engineering = insert/manipulate DNA → new varieties

- Selective breeding → desirable traits in several generations
- Genetic enginering → desirable traits in short time

GMO

Potential = can insert genes →

- Disease resistance
- Cold and drought resistance
- Salt and acid tolerant

- Pharming = genetically engineered organisms → medicines

- Herbicide resistance makes low till farming possible

- Bt genes decrease insecticides

Cons

- **Environmental concerns**
- (spread of pollen and seeds →
- super weeds and super bugs)

- Round up ready plants →
- Increase in use of glyphosate herbicides

- **Health concerns**
- exposure to new proteins → allergies
- Increase pesticide resistance → increase in insect born diseases

X. Post Green Revolution Recommendations

- Increase species diversity on farms
- Breeding disease-resistant crops and maintain healthier conditions for animals (no antibiotics)
- Water and energy conservation
- Select crops best adapted to a particular environment
- Use natural predator prey relationships to control pests
  - Must make sure the predator does not affect too many non target species.
- Soil conservation
  - Ex: (wind breaks, conservation tillage and contour plowing
- Maintain soil nutrient quality
  - Ex: (composting and crop rotation)
- Integrated pest management
  - Ex: (combination of controls: biological, mechanical, and chemical)

Fishing

- Overfishing has led to the commercial extinction of many fish
- Tragedy of the Commons
- Fish farms can be a way to produce high protein foods for many people particularly in coastal regions.
  - Cons:
  - Expensive,
  - high densities → parasites and diseases,
  - maintaining water quality = difficult

Denmark What a Shame??

The following images were sent in an email with the following message

- Denmark is a big shame – the sea is stained in red because of the cruelty of “civilized” humans.
- Every year on Feroe Island hundreds of the famous and intelligent Calderon dolphins are slaughtered . The main participants are young teens. Why???
- To show that they are adults and mature…BULLLshit!!!
- In this big celebration everyone is participating in one way or another, killing and spectating just for sport.
- Is it necessary to mention that the dolphin is threatened around the world simply because they are curious – coming near humans to play and interact in a way of pure friendship.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- They don’t die instantly; they are cut 1,2, or 3 times with thick hooks.
- At that time the dolphins produce a grim cry compatible with that of a new born baby.
- He suffers and there is no compassion
- Please sign a petition against this cruelty


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- While at first disturbing it is important to learn the facts before judging
- When you do some digging you find that this is a tradition not unlike seal hunting in the Inuit culture
- Every part of the animal is used from the meat to the oil to the skin..
- It then becomes a question of how can you condemn this and then eat meat from a slaughterhouse. Total double standard

- **Hunting and fishing can be a vital means of survival and of population control/game management** BUT **if not highly regulated** I'm afraid that overfishing and overhunting of this sort will lead to the "tragedy of the commons"

- Eating meat & fish in extreme northern cultures historically has been a matter of survival, but if that is no longer a fact and the typical diet is no longer dependent upon hunting for survival and this has become just a tradition/rite of passage for the youth of Denmark then this is to be condemned particularly in light of the fact that as **marine mammals their numbers are low enough to warrant protection in US waters according to the Marine Mammal Protection Act**

- Most disturbing to me is the volume of blood pictured in the bay of the massacre.
- Any viral or bacterial pathogen from any of those animals has now been released into the environment on a massive scale
- threatening not only pilot dolphins but all marine mammals

Technologies associated with Overfishing

- Trawling with sonar (Sonar finds schools of fish and catch in large bag nets pulled by boat)
- Drift nets (fish gills get caught in net)
  - kills dolphins and other marine mammals who need to come up for air
- Long line fishing = long lines with hooks

- Problems = bycatch (unintended species are killed), → overharvesting

Aquaculture

- Advantages
  - Highly efficient
  - crossbreeding and genetic engineering → increased yields
  - Little use of fuel
  - Profits not tied to price of oil

- **Disadvantages**
  - **Large inputs of land, feed (often grain) and water needed**
  - **Large concentration of wastes**
  - **Density dependent factors (disease, parasites) → dec.yields**

Laws preventing Overfishing = tragedy of the commons

- Marine Mammal Protection Act – protection and conservation of marine mammals
- Magnuson Act – establishes regional fisheries management councils that set quotas, size limits and seasons
- Marine Sanctuaries Act – protects habitat for marine organisms and protects animals from being harvested in that area

The Pesticide Story

- Monsanto = chemical company
  - DDT = insecticide → bioaccumulation
  - Agent orange (2,4DT) → dioxins = carcinogen
  - Roundup (glyphosate herbicide)
  - GE soybeans = roundup resistant flooded the market
    - Made farmers totally dependant on Monsanto products
    - Crossbreeding with wild species and natural selection → superweeds (herbicide resistant, noxious)

Pesticide Laws under the Food, Drug and Cosmetics Act of 1938 (FDCA)

- Federal insecticide, fungicide, rodenticide act (’47) (requires testing of all active ingredients in pesticides → effectiveness
- Miller Amendment(’54) = FDA determines acceptable levels of pesticides in food
- Delaney Clause (’58) = carcinogens (cancer causing chemicals) not allowed to be added to food)(overlooked pesticides on raw foods)
- Food quality protection Act (`96)→ stricter guidelines includes raw foods in the Delaney Clause

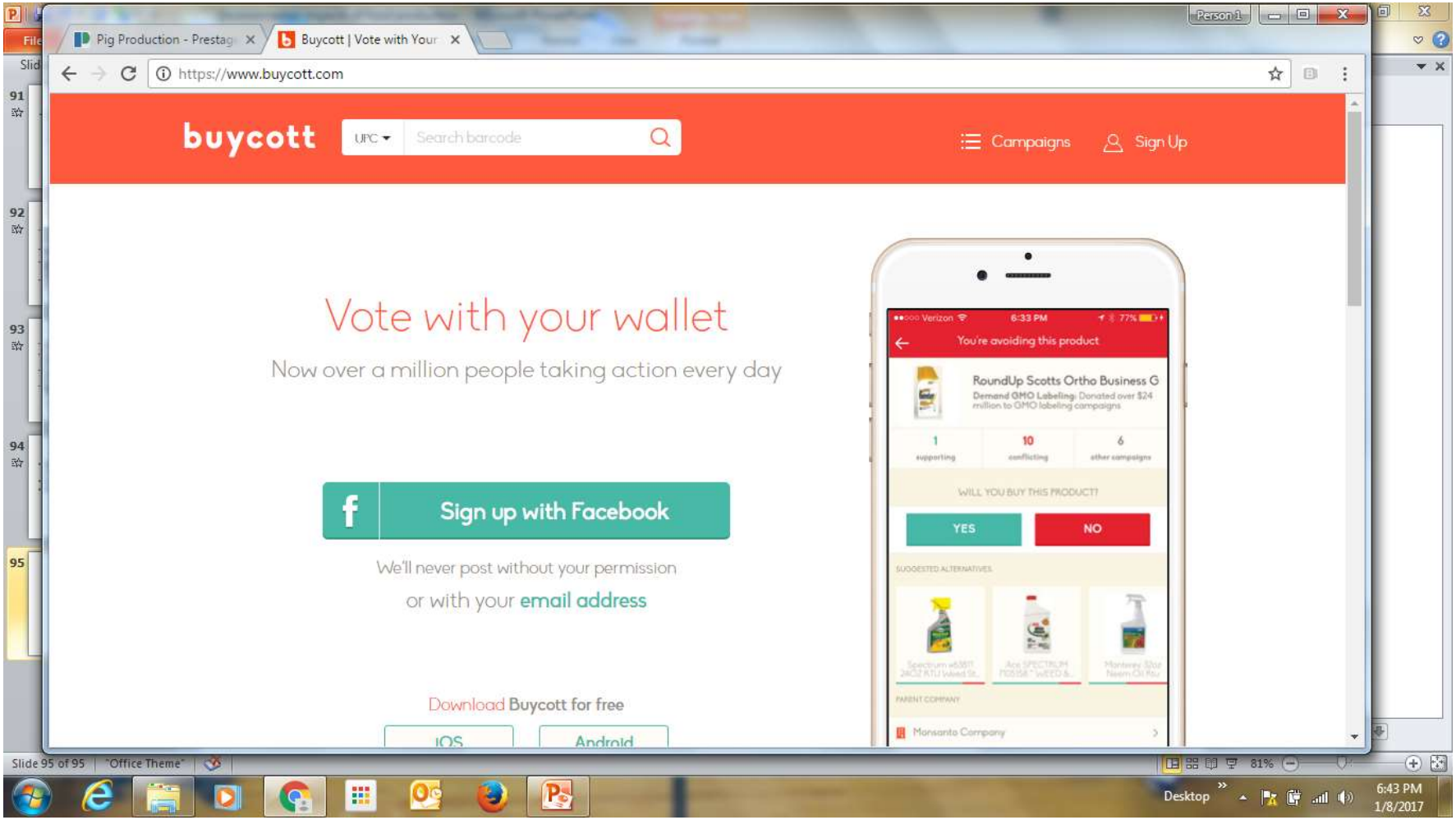
Ag and food related laws

- Soil conservation Act 1935 set up soil conservation association (now the NRCS) to prevent erosion
- Clean Water Act 1977 → EPA sets minimum effluent standards for industries (including industrial farming industries) and → permits and testing
- Safe Drinking Water Act of 1974/86/96 → EPA and state governments work to make sure safe drinking water standards are met
- Organic Food Production Act 1990 → USDA sets standards for certification of organically grown foods
  - Certified organic = Land must be free of synthetic pesticides and inorganic fertilizers for at least 3 years
  - Chicken and beef labeled - Free range must be raised in open pastures or fields rather than pens and are not treated with antibiotics or hormones.

7 Billion People

- Feeding 7 billion is a huge challenge one that will require innovation and technology
- Current technology systems = unsustainable
- Finding more arable land is NOT an option

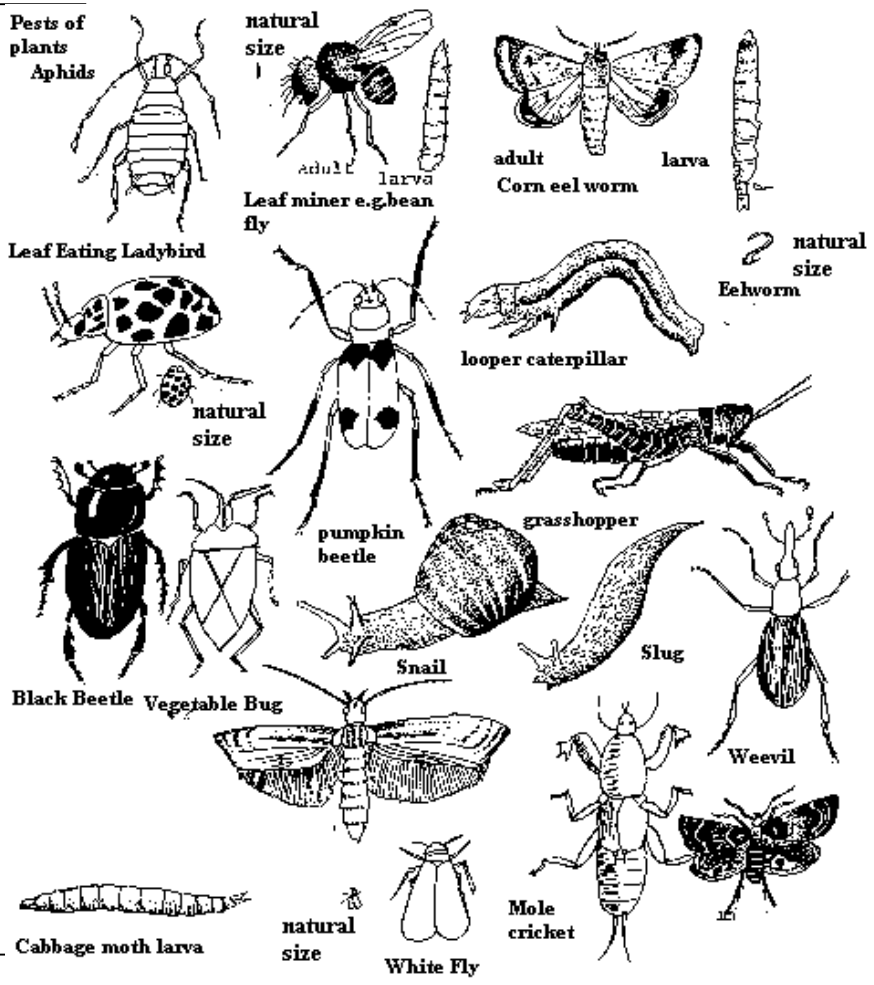
Buycott apps allow you to scan the barcode of all products → information about the company producing it



Pesticides and Pest Management

Pest = any organism that

- Interferes with human activities
- Competes for food
- Carries disease



Integrated Pest Management

- IPM = Includes more than one method of pest control

- Use pesticides only when pests reach economic thresholds
  - (last resort)

Pest control

- Mechanical = use of cultivation methods or physical control (ex: hand picking, vacuuming, intercropping
- Biological = take advantage of ecological relationships (ex: natural predators)
- Chemical = use of pesticides

Biological control

- Ex #1: Pheromone traps
  - Pheromone = chemical messengers naturally produced by other organisms to attract mates or communicate with others
- Ex #2: Use natural predators and parasites.
  - Whitefly pests harm greenhouse plants.
    - Use Ladybug *Delphastus* eat whitefly eggs and larva
    - Use tiny parasitic wasps (*Encarsia formosa*)
  - Attract birds by supplying habitat

Ant Phermones

- http://www.youtube.com/watch?v=5HKl8Luuotw&safe=active

Biological control

- Ex #3: Companion planting = use of plants that naturally repel pests or attract beneficial insects (ex: marigolds keep earwigs out of crops)
- Ex #4: Bacillus thuringiensis = natural soil bacteria that can kill specific pests
  - (ex: Bt added to streams to kill black fly larva)

Biggest concern

- Biological controls impact nontarget species or become invasive

Pesticide = chemical → kills pests

- Herbicides kill weed pests
- Insecticides kill insect pests
- Fungicides kill fungi
- Rodenticides kill rodents (rats, mice, gophers…)

Responsible use of chemicals

- Use narrow spectrum (more specific)
- Only use when problem → economic losses
- Chose less toxic biodegradable chemicals

3 types of insecticides

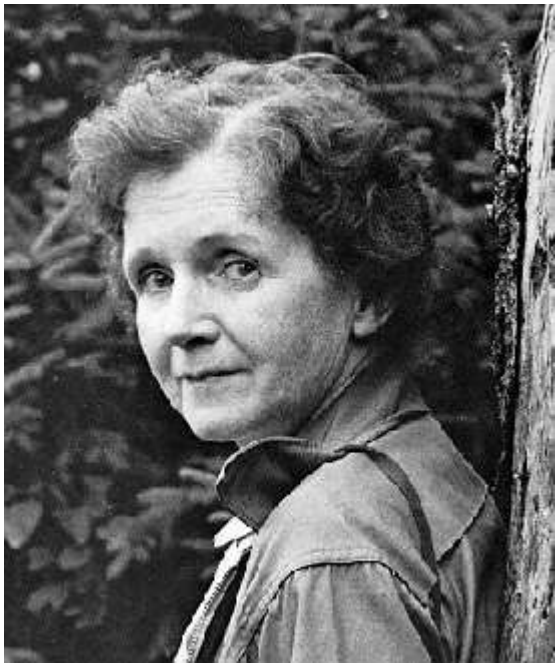
- Chlorinated hydrocarbons (ex: DDT)
    - Persist, bioaccumulate, broad spectrum
- Organophosphates (ex: malathion)
    - does not persist, biodegradable but highly toxic to birds, fish, bees and animals (nerve gas)
- Carbamates (ex: aldicarb)
    - Broad spectrum, not as toxic , does not persist

2 types of herbicides

- Nonselective = kill all vegetation
- Selective = specific (only grasses or only broad-leafed

Rachel Carson exposed problems with pesticides

- Silent Spring exposed problems with DDT and other pesticides

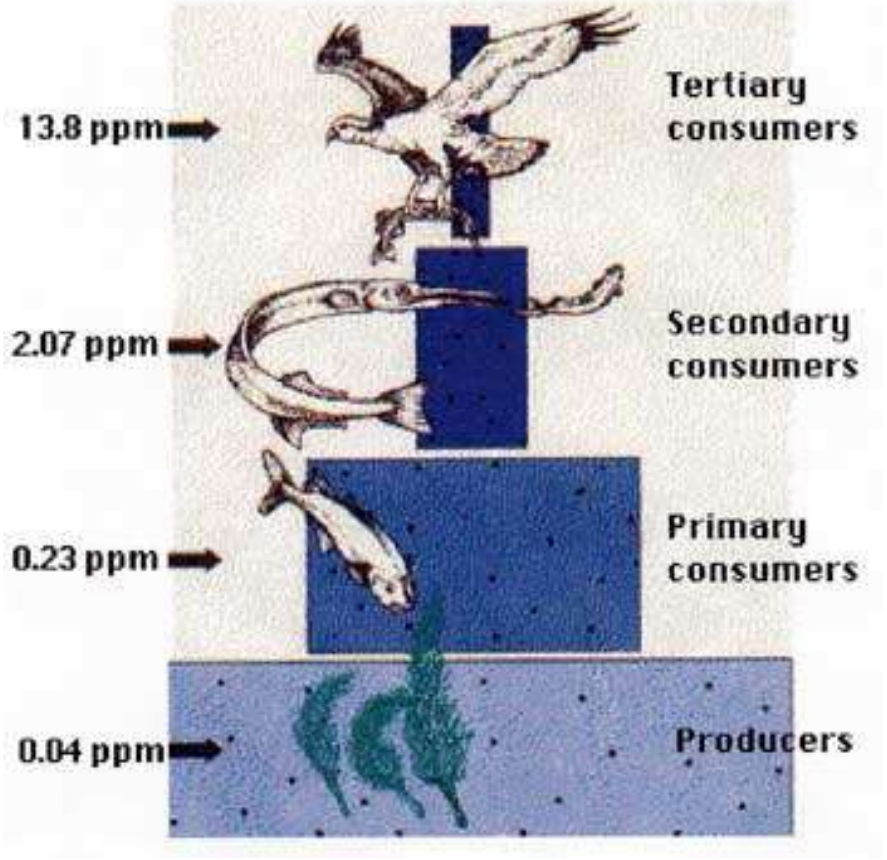


Problems with chemical control

1. Some chemicals persist and enter food chains where they accumulate
   - Some pesticides,
   - radioactive isotopes,
   - heavy metals and
   - industrial chemicals like PCB

1. Biomagnification or bioaccumulation

- Examples:
- DDT = insecticide sprayed to kill mosquitoes →built up in tissues of fish and eagles → made eagle shells soft destroyed eagle populations.
- PCB's = industrial solvent dumped into the Hudson River → makes fish unfit to eat



http://seagrant.uaf.edu/nosb/papers/2004/images/apexfig4.jpg

Agent Orange (mix of 2,4D and 2,4,5T

- Used in Vietnam → destroy crops and expose hiding places of Vietcong
- Destroyed forests, contaminated soils with DIOXIN (persist)
- **Dioxins → birth defects, soft tissue cancers, skin disease and urological problems**
  - **From pesticides and burning at low temperatures (ex: burn barrels)**

http://www.ffrd.org/Voices/agent-orange-cropdusting.jpg

2. Pesticide resistance

- Pesticide use → pesticide resistance → Pesticide treadmill = farmers pay more and more for chemicals that become less effective over time
- Evolution = change in population
  - Variation naturally occurs in populations (due to sexual reproduction and mutations)
  - Add pesticide → naturally resistant pests are best fit → survive and reproduce → increase in resistant ones
  - Insects evolve quickly due to short generation times

3. Chemical pesticides kill non-target organisms (toxic)

- Pesticides travel in air and runoff into waterways
- Ex: Dieldrin used to kill Japanese beetles → lg # of dead organism (squirrels, birds, cats, rabbits and beneficial insects) (banned in US)
- Narrow spectrum pesticides are more specific than broad spectrum

http://www.ces.purdue.edu/CES/Marion/Images/Hort/Japanese%20Beetle%2050.JPG

Integrated Pest Management

- Variety of control methods
- Can include
  - Biological
  - Responsible use of chemicals and
  - Mechanical methods

Responsible use of chemicals

- Use narrow spectrum (more specific)
- Only use when problem → economic losses
- Choose less toxic biodegradable chemicals

Pro Arguments (to spray)

- Disease control
  - Ex: Malaria kills ~2.7 mil people in tropical countries/yr
  - DDT effectively kills anopheles mosquito which carries disease
    - Sri Lanka = DDT spraying (2mil cases → 0), stopped spraying in 64 (due to bird deaths) → more than 1mil by '68
- Minimize agricultural loss (economic incentive)

Con Arguments (not to spray)

- Pesticide resistance
  - Can be minimized by maintaining some untreated plants, avoid overuse of 1 type
- Disrupt ecosystems
  - Bioaccumulation, kills non-target species, → decrease in natural predators

More con arguments

- Risks to human health
- Acute symptoms (immediate from high doses)
    - Ex: Bhopal, India Union Carbide pesticide plant explosion → toxic cloud killed ~5000 people
- Chronic symptoms (long lasting)
    - Ex: increased cancers and reproductive disorders in farm workers
- Children more susceptible (still developing and closer to the ground)