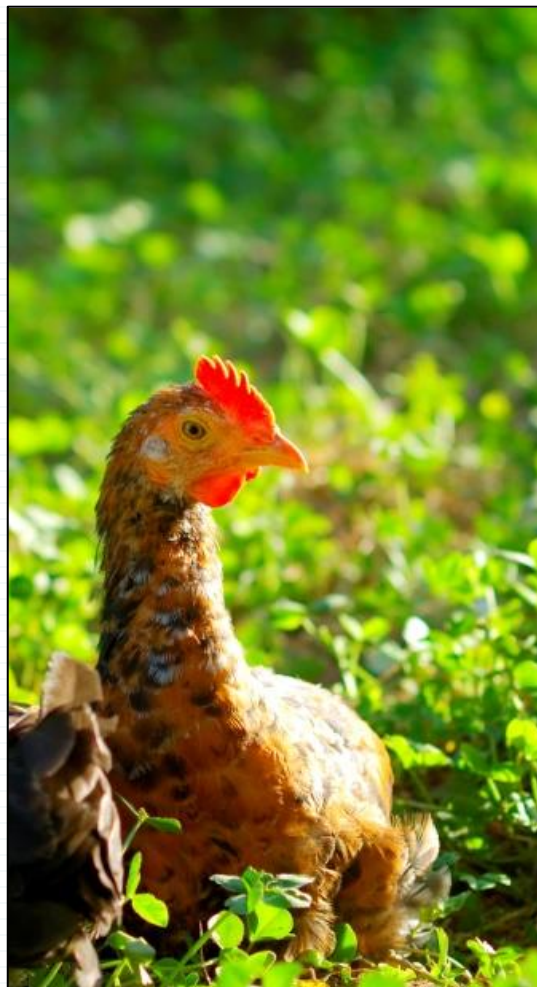


# Food Animal Production | *Slides*



Images copyright.



# Overview

- **Industrialization**
- **Industry concentration**
- **IFAP impacts**
- **Trends in consumption, production**
- **Alternative production systems**
- **Seafood harvest and production**
- **Reflection**

# Essential questions

- Do the benefits of raising food animals in an industrial system outweigh the risks?
- Who controls the food system? Why does it matter?
- What are the hidden costs of inexpensive food? How might these costs be addressed? How might they be made more transparent to consumers?
- Why are animal products from more sustainable operations generally more expensive than products from the prevailing industrial system? Should they necessarily cost more? If so, how could consumers more easily afford to include them in their diet ?

# Essential questions

- How does the prevailing industrial approach to raising food animals compare with raising them on pasture? What are the strengths and limitations of each?
- What are the advantages and disadvantages of allowing farmers greater autonomy over how to raise their animals?
- What can be done to foster more sustainable forms of food animal production that minimize risks to health? What are the roles of consumers, industries, policymakers, rural communities, researchers and other stakeholders?



# Overview

- **Industrialization**

Industry concentration

IFAP impacts

Trends in consumption, production

Alternative production systems

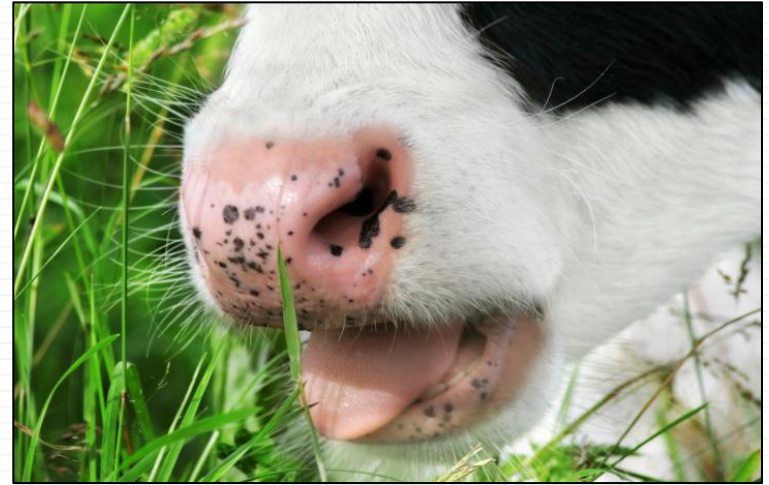
Seafood harvest and production

Reflection

# Industrialization

## Traditional food animal production

- Small scale
- Independently owned
- Access to pasture
- Diversified



Socially Responsible Agriculture Project. *Hogs raised in a hoop house system outside of Euphrata, WA. 2008.* [www.sraproject.org](http://www.sraproject.org). Other images copyright.

# Industrialization

## Mechanization

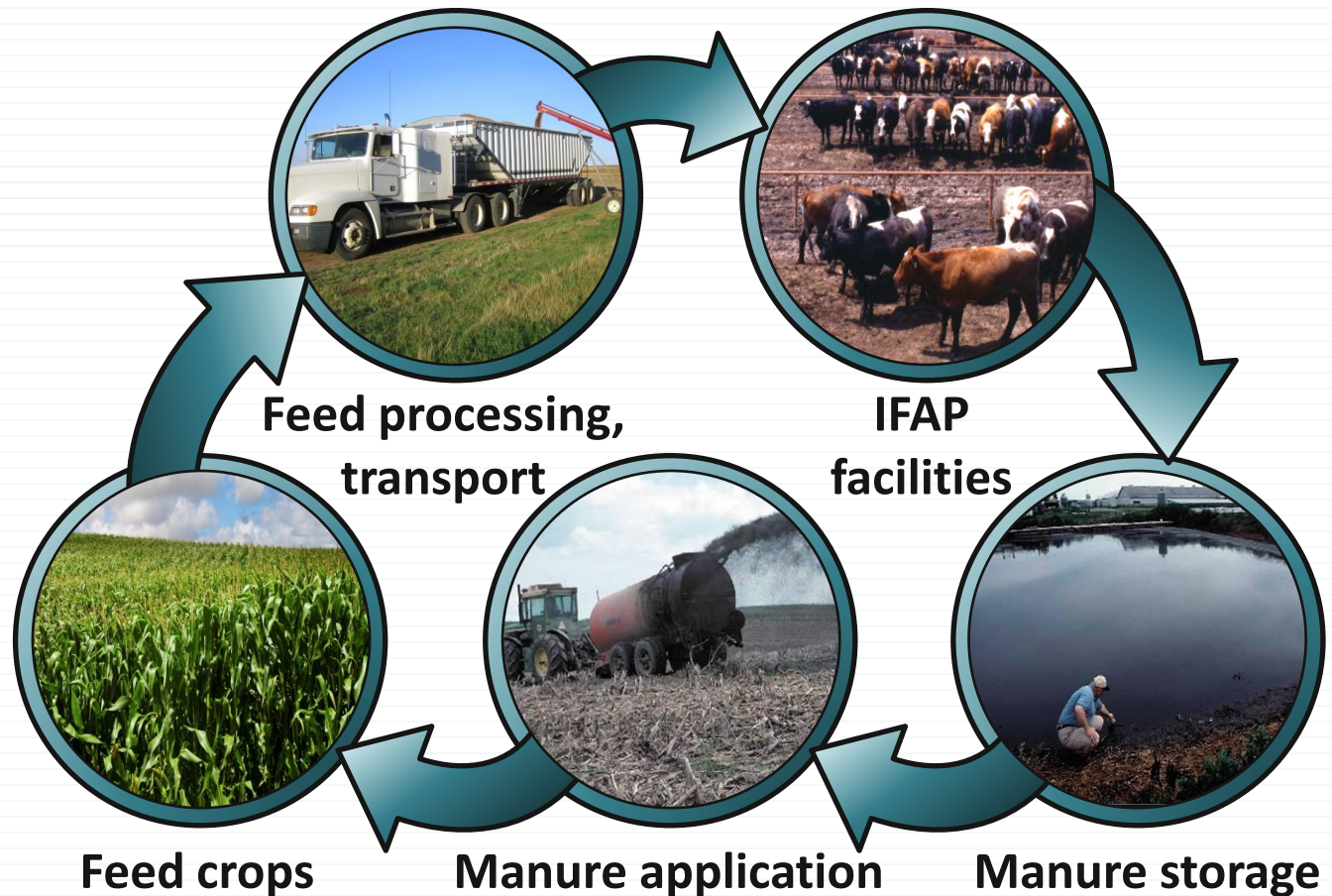
- 1930s:
  - Mechanized hog “disassembly” lines
  - First stage of meat supply chain to be industrialized
  - Inspiration for Henry Ford’s assembly lines
  - Poultry, cattle followed in the 1950s



*Mechanized poultry processing plant.*  
[www.cecilbuffington.com](http://www.cecilbuffington.com). Public domain.

# Industrialization Specialization

- Separation of animals from crop production

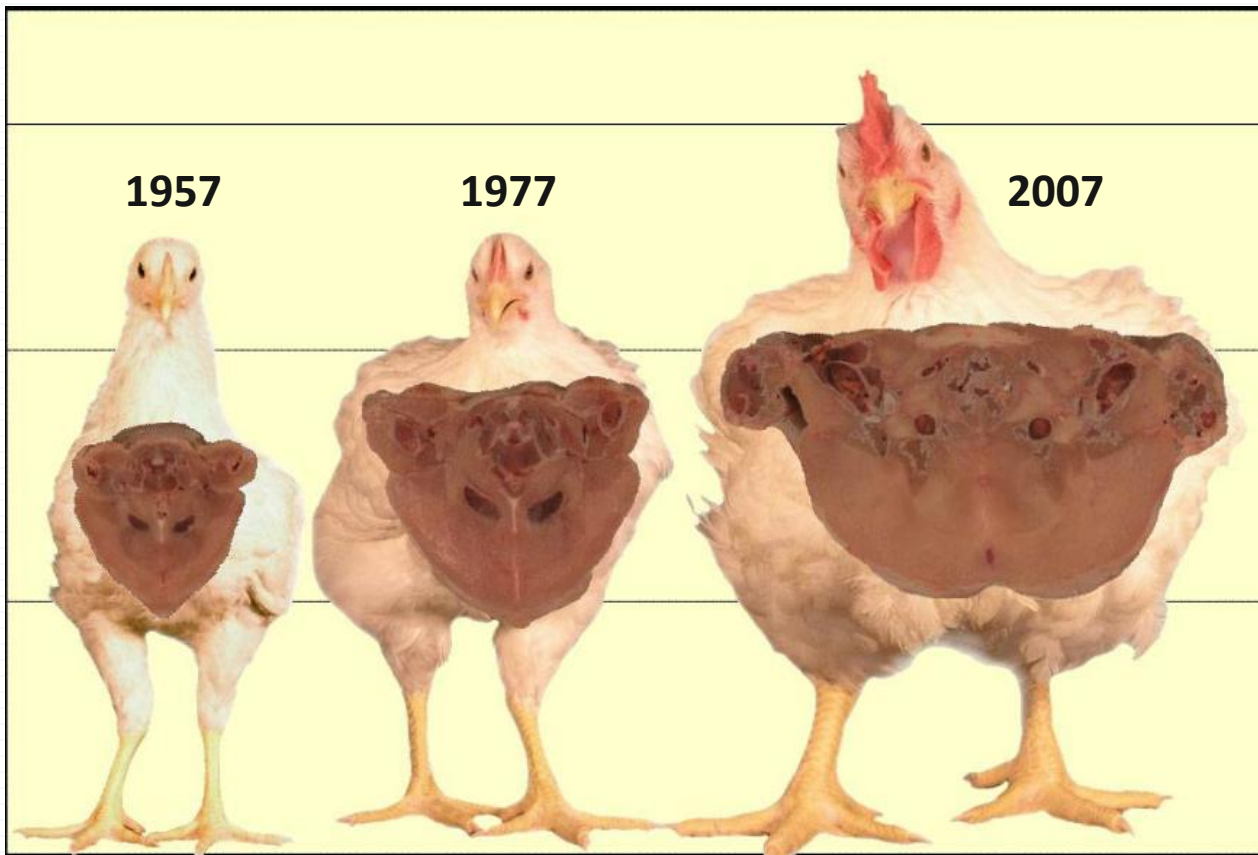


Feed images copyright.  
Others images: USDA.



# Industrialization Specialization

- Genetics, nutrition



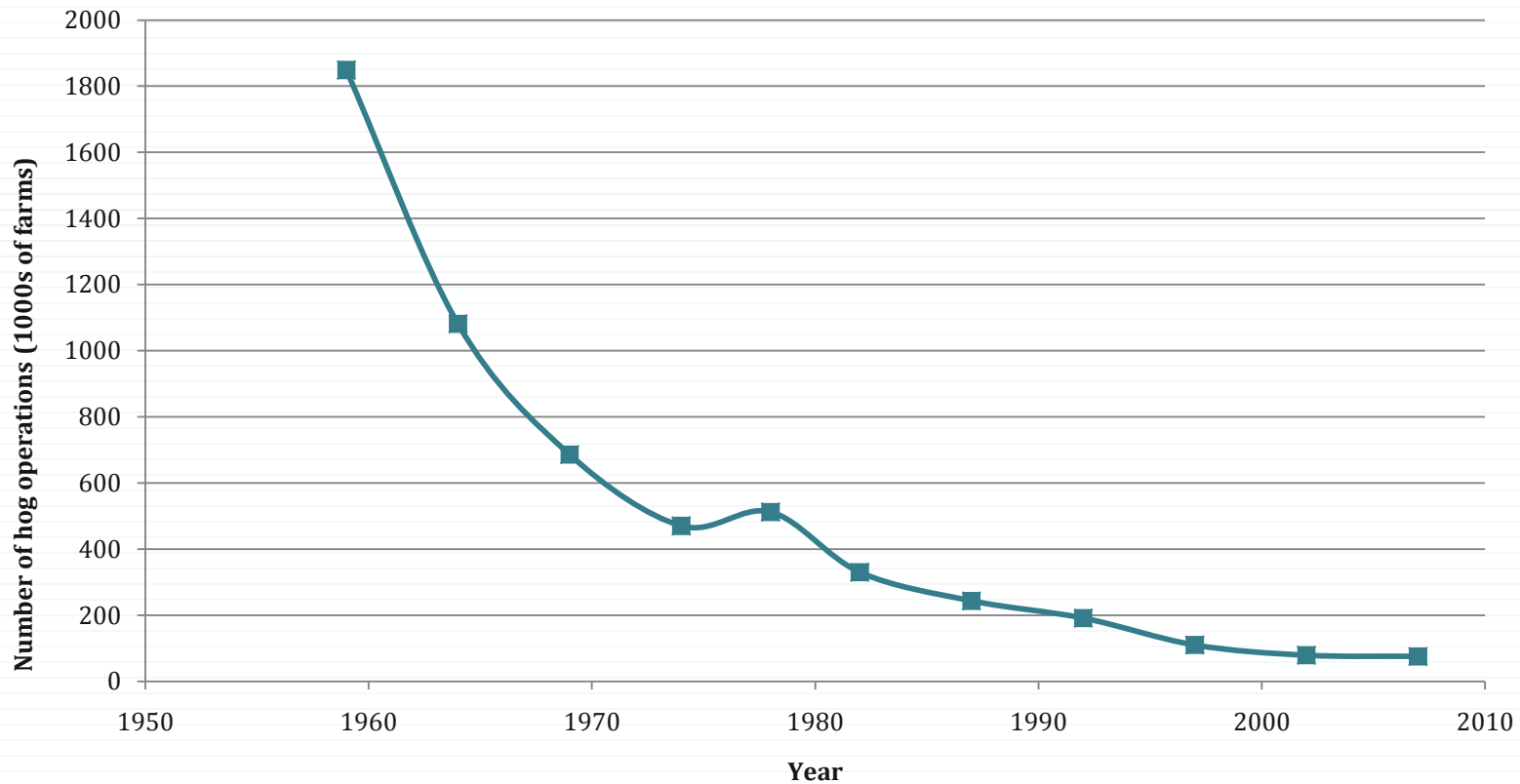
1957, 1977 and 2007 broiler poultry breeds, raised on the same diet, after 55 days.

Poultry Research Centre. University of Alberta, Edmonton, Alberta, Canada. [www.canadianpoultrymag.com/content/view/953/38/](http://www.canadianpoultrymag.com/content/view/953/38/). Used with permission.

Contact: [martin.zuidhof@ualberta.ca](mailto:martin.zuidhof@ualberta.ca).

# Industrialization Consolidation in the hog industry

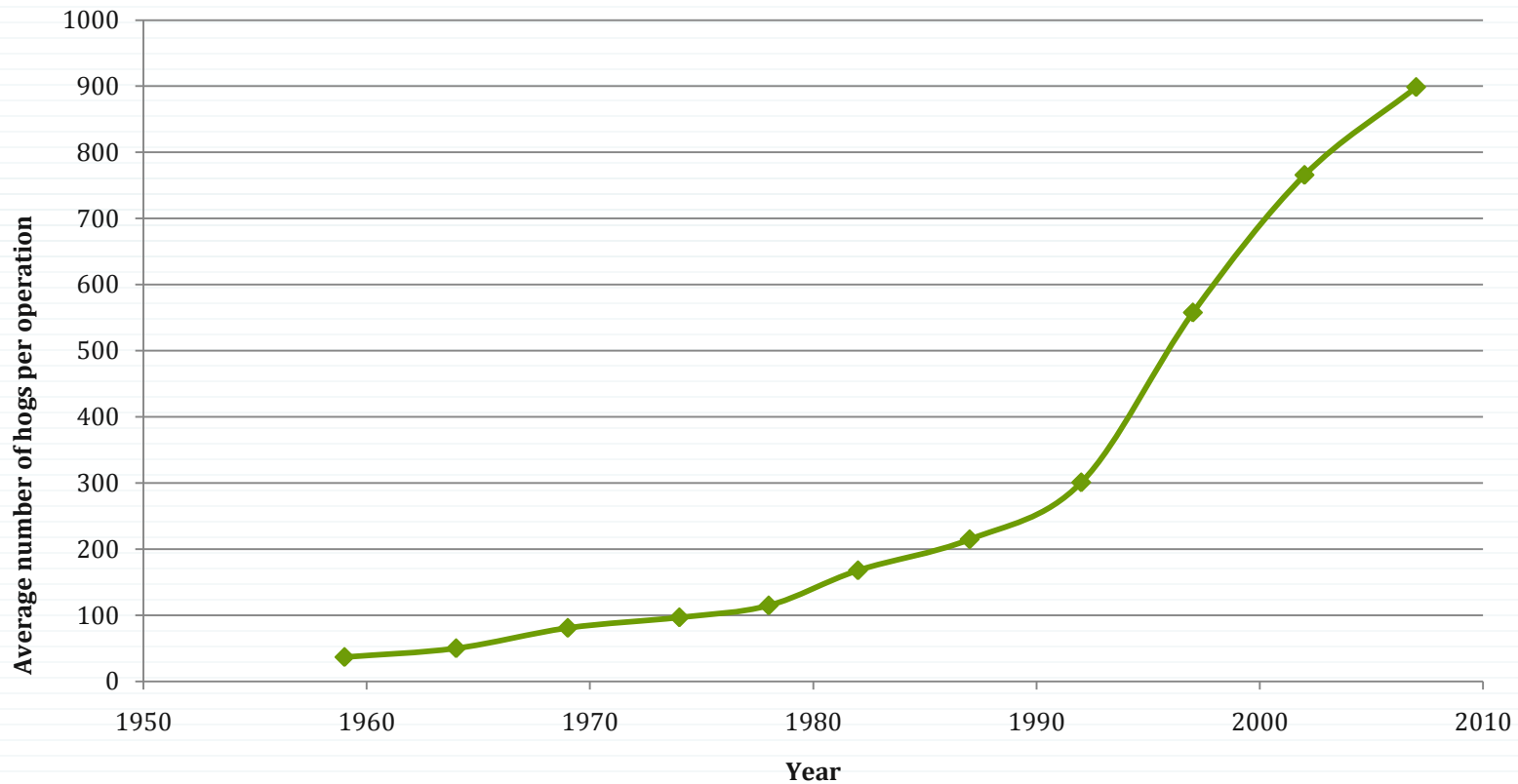
## Hog Operations, 1959 - 2007



USDA National Agricultural Statistics Service. *The Census of Agriculture*.

# Industrialization Consolidation in the hog industry

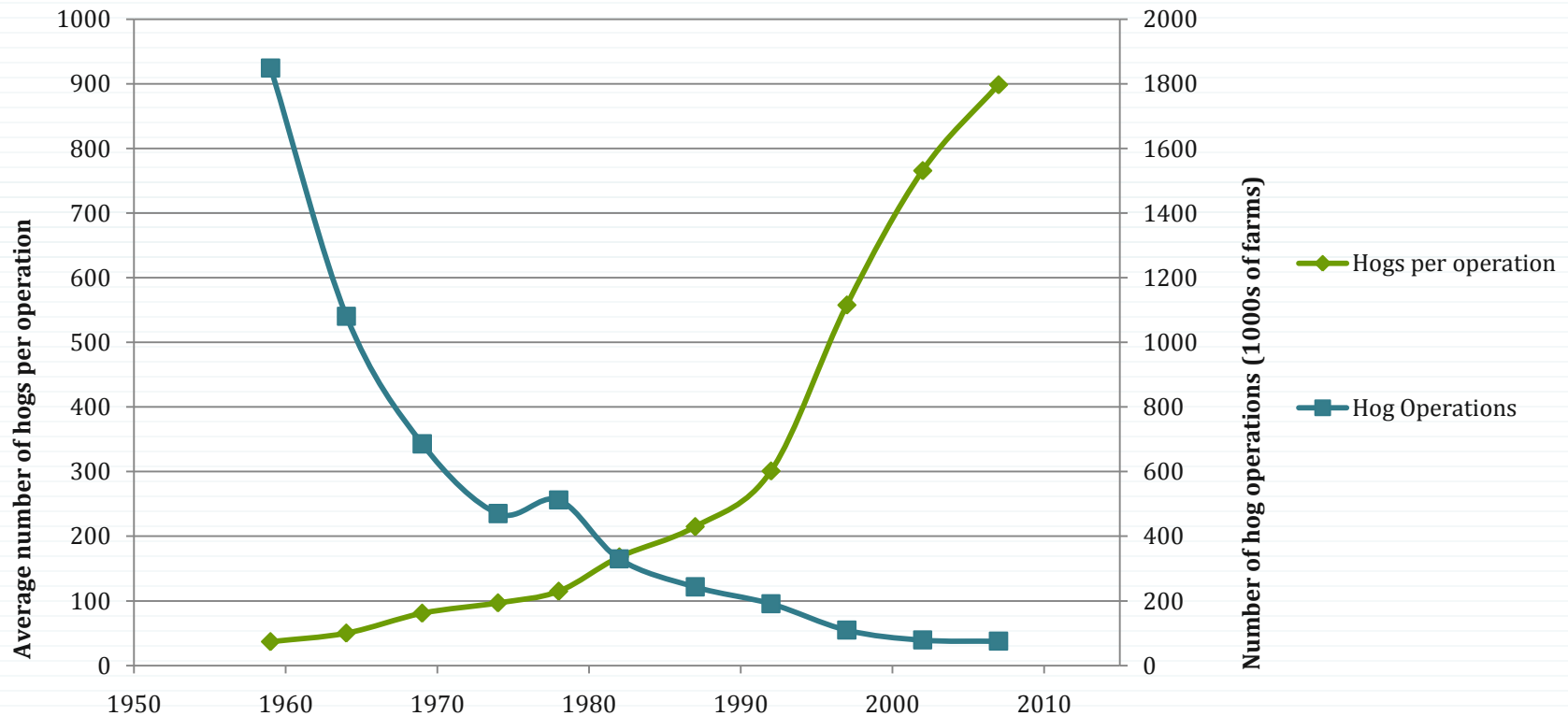
Hogs per operation, 1959 - 2007



USDA National Agricultural Statistics Service. *The Census of Agriculture*.

# Industrialization Consolidation in the hog industry

## Change in Hog Industry Structure, 1959 - 2007

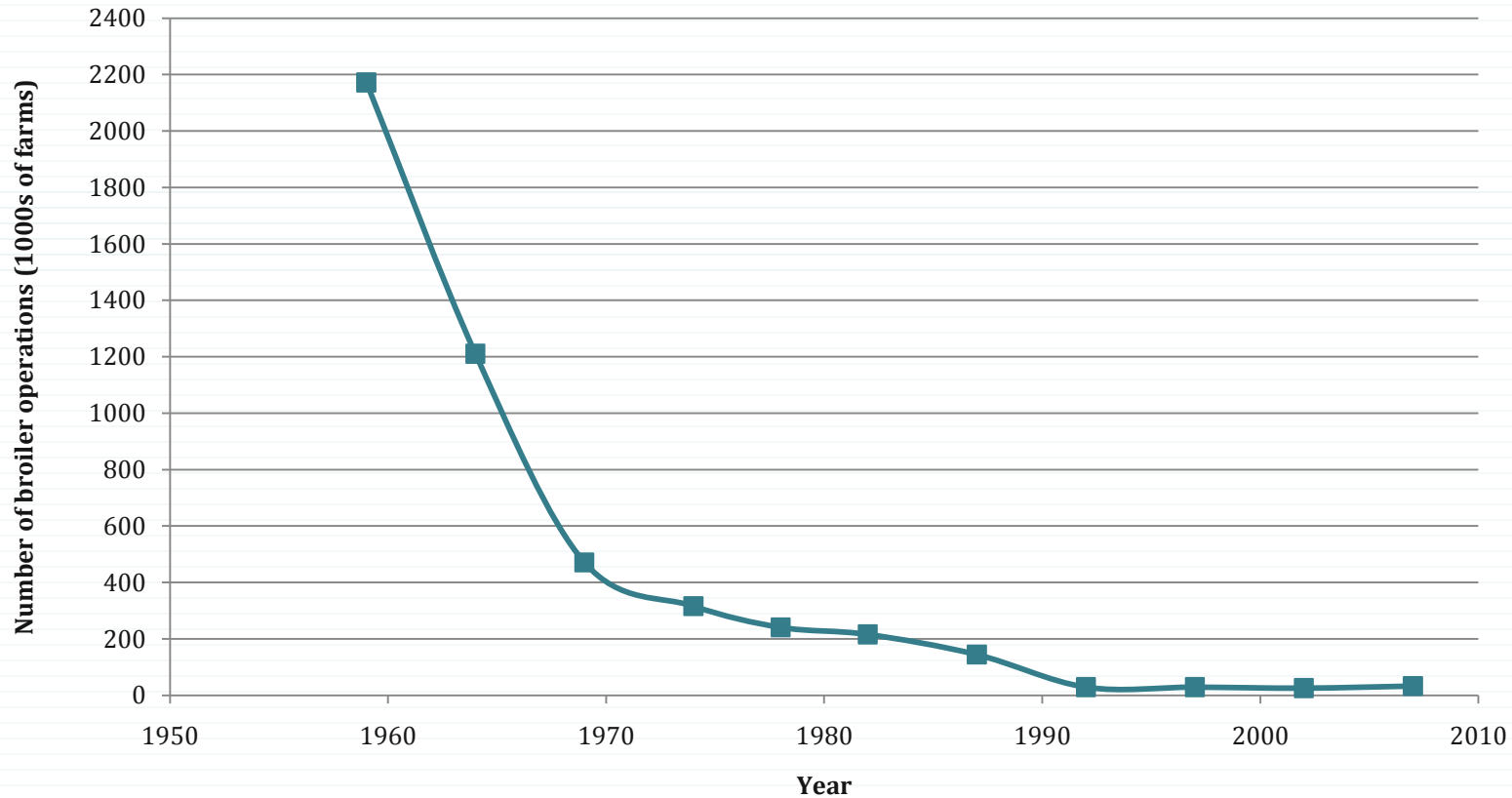


USDA National Agricultural Statistics Service. *The Census of Agriculture*.

# Industrialization

# Consolidation in the poultry industry

## Broiler Operations, 1959 - 2007

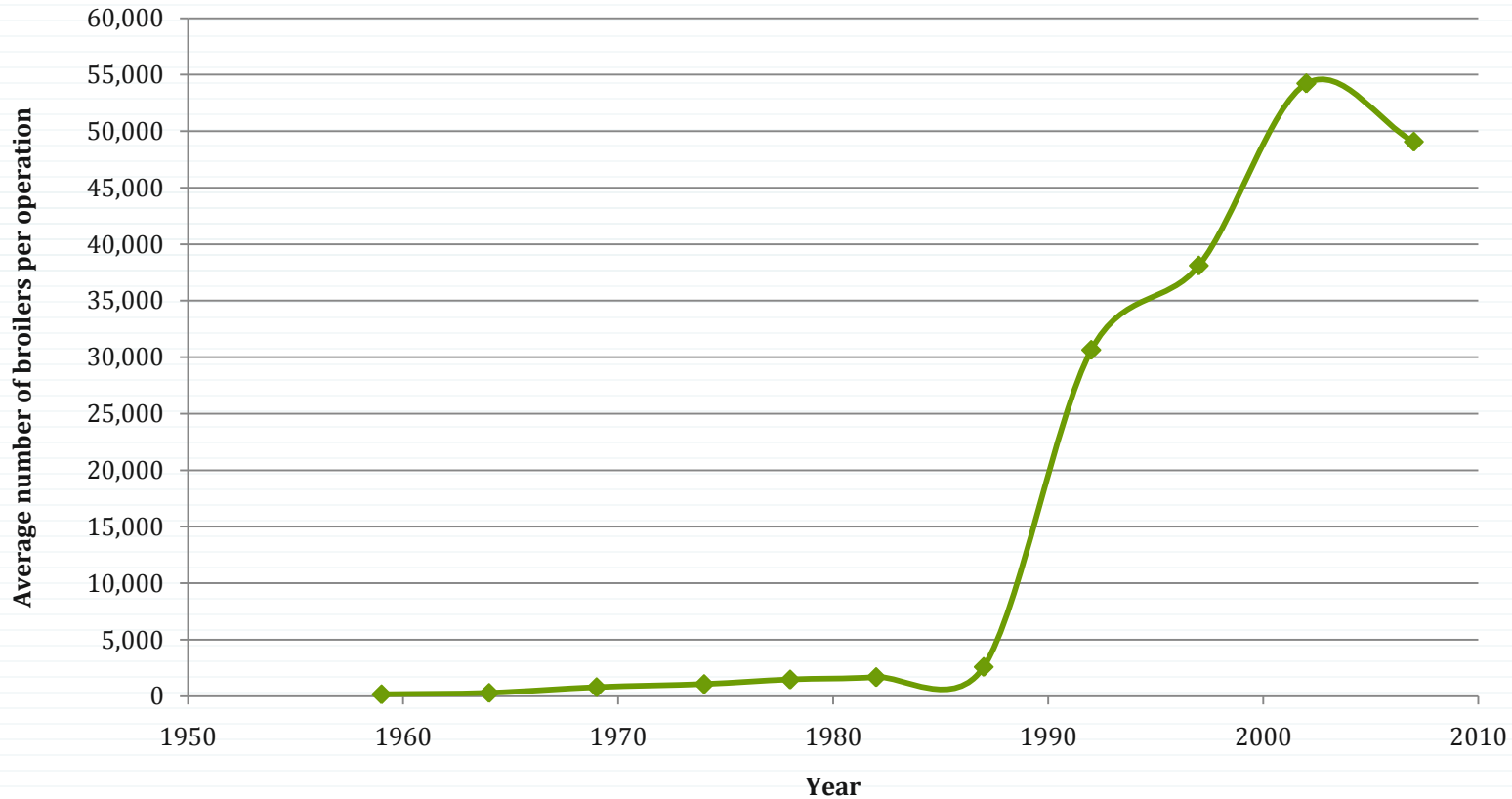


USDA National Agricultural Statistics Service. *The Census of Agriculture*

# Industrialization

# Consolidation in the poultry industry

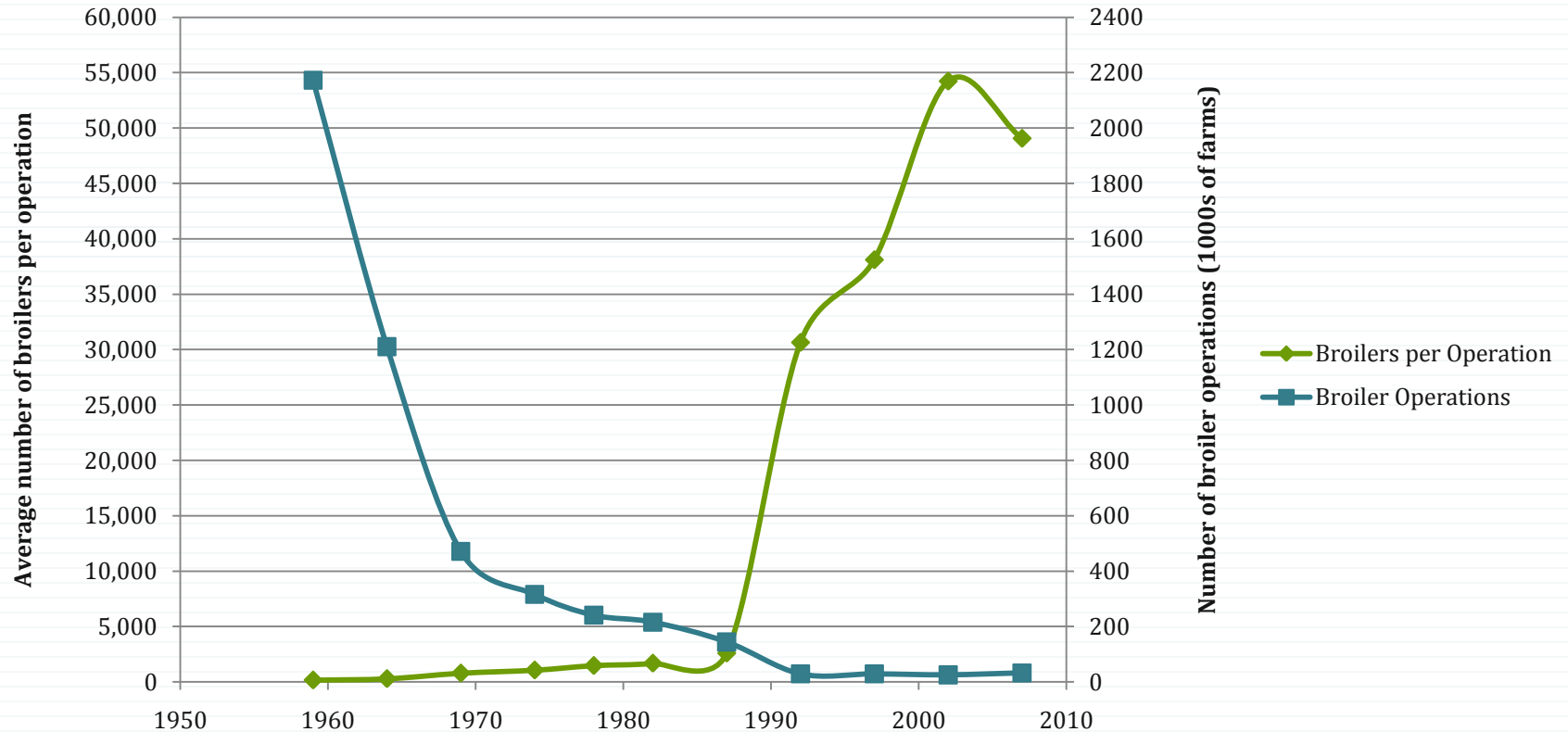
## Broilers per Operation, 1959 - 2007



USDA National Agricultural Statistics Service. *The Census of Agriculture*

# Industrialization Consolidation in the poultry industry

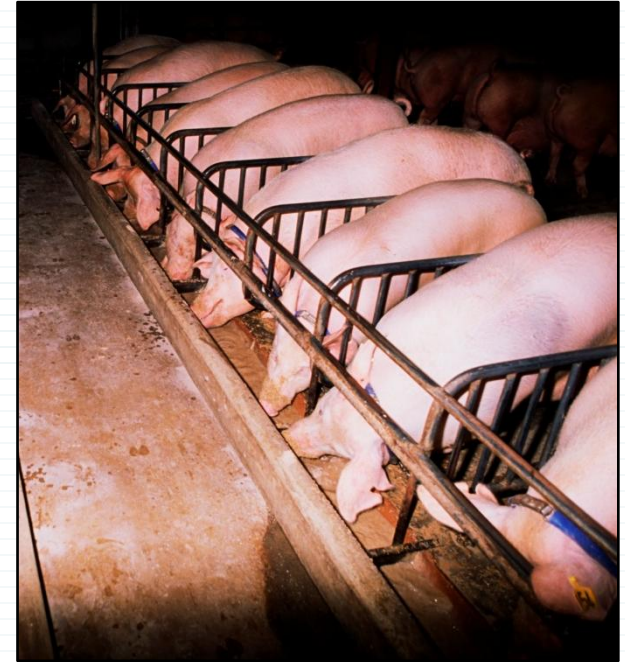
## Change in Broiler Industry Structure, 1959 - 2007



USDA National Agricultural Statistics Service. *The Census of Agriculture*

## Industrialization

# Industrial food animal production (IFAP)



- Most U.S. animal products (meat, milk, eggs) come from IFAP facilities

Middle: Socially Responsible Agriculture Project. *Chicken factory farm. The flock has been cut back from normal density by 14,400 chickens. 2009.* [www.sraproject.org](http://www.sraproject.org). Other images copyright.



# Industrialization

## IFAP: hogs and poultry



- 1,000s of hogs
- 100,000s of chickens
- Crowded indoor houses

Hog house: Horrigan L. 2010.

Poultry house: Socially Responsible Agriculture Project. [www.sraproject.org](http://www.sraproject.org)

# Industrialization

## IFAP: cattle

- Beef CAFOs house over 1,000 of animals
- Beef supply chain:



Cow-calf  
operation



Stocker



Feedlot

Cow-calf: Weller K. USDA ARS photo library. Stocker: Bauer S. USDA ARS photo library.

Feedlot: Socially Responsible Agriculture Project. *Crowded conditions in a beef cattle feedlot*. 2009. [www.sraproject.org](http://www.sraproject.org). Other images copyright.



# Overview

Industrialization

- **Industry concentration**

IFAP impacts

Trends in consumption, production

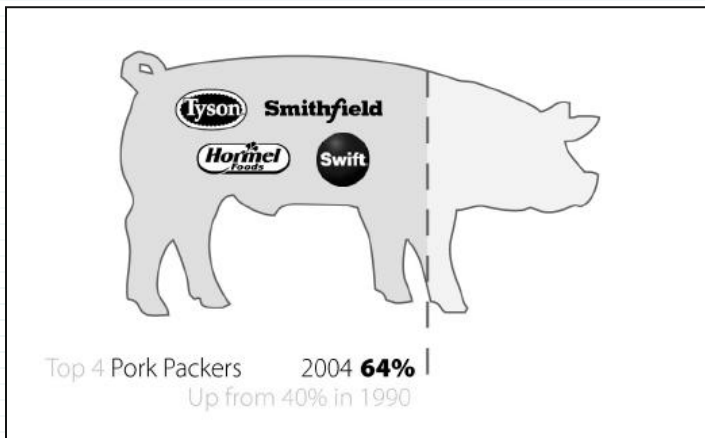
Alternative production systems

Seafood harvest and production

Reflection

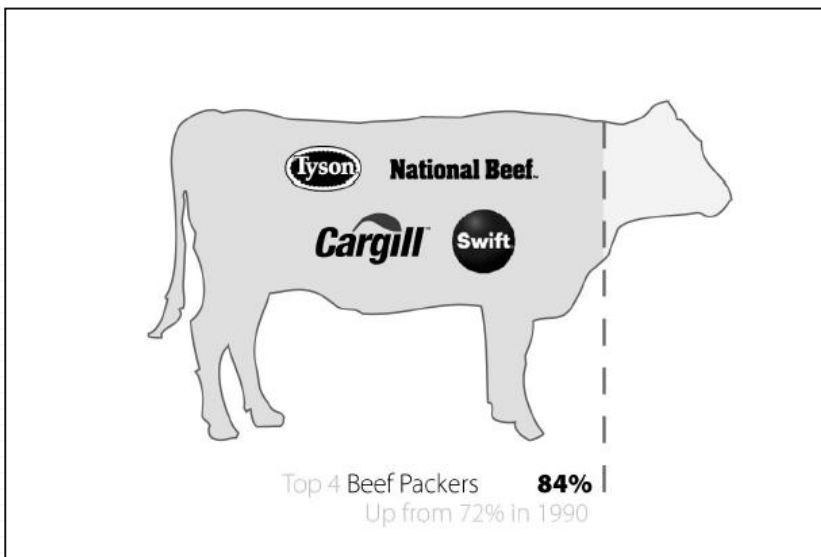
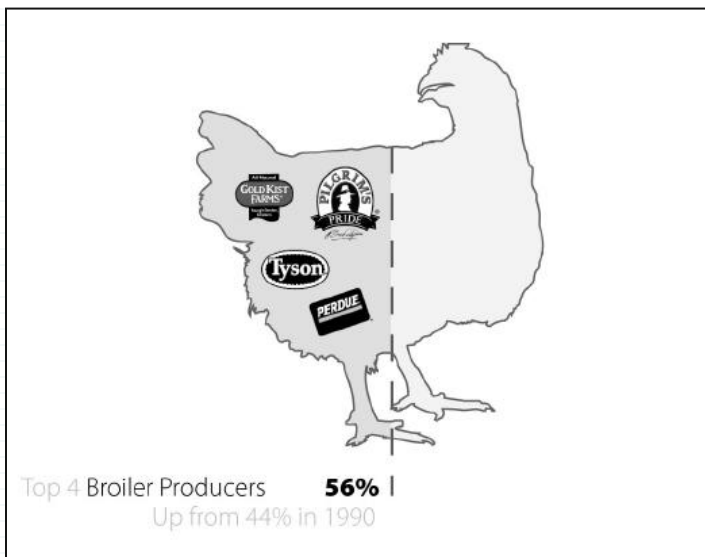
# Industry concentration

## Horizontal integration



Anna Lappé and theCoup.org.  
GRUB Graphics; 2004.  
[www.eatgrub.org](http://www.eatgrub.org).  
Used with permission.

Data from Hendrickson, Heffernan.  
*Concentration of Agricultural Markets*,  
University of Missouri; 2005.



Industry concentration

# Horizontal integration

- Buyouts
- Mergers

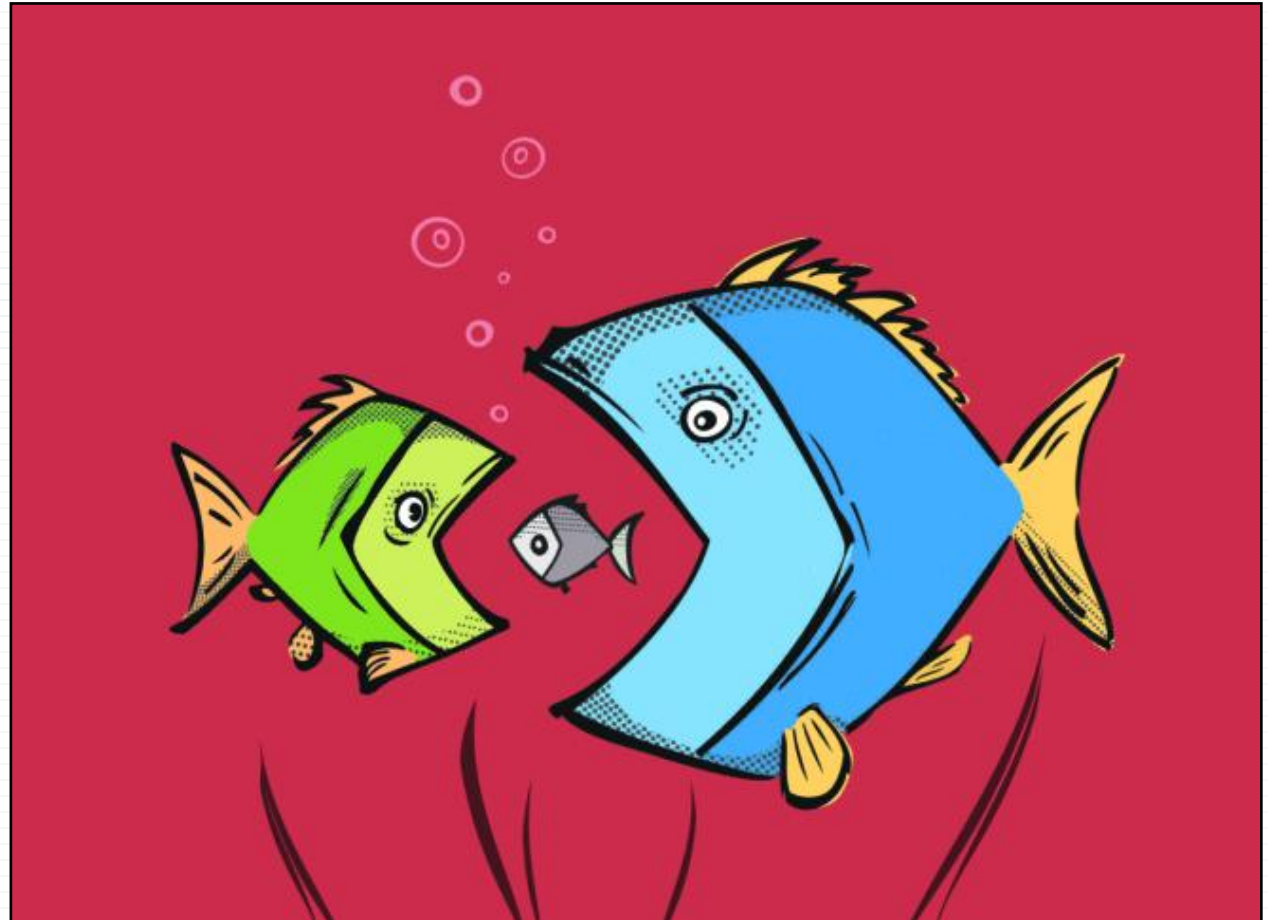
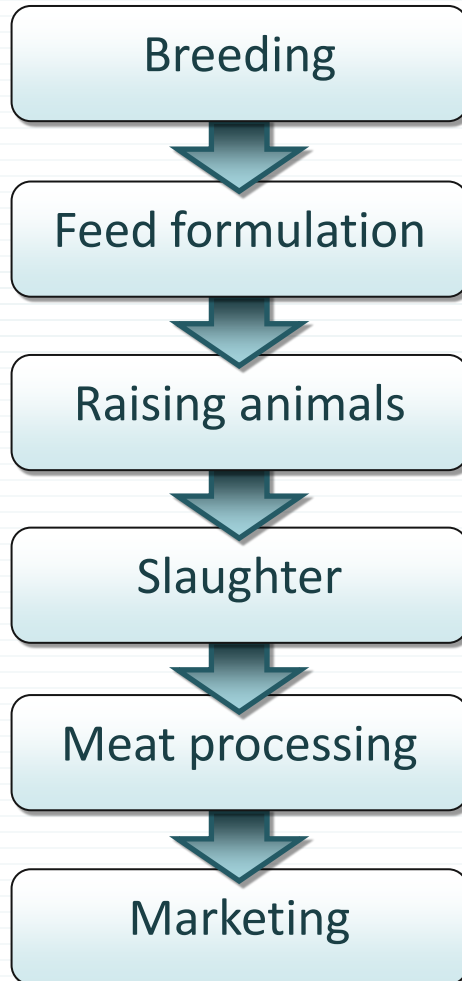


Image copyright.

## Industry concentration

# Vertical integration



- Extent to which single firm owns multiple stages along product supply chain
- Seen in hog, poultry industries

# Industry concentration

## Vertical integration

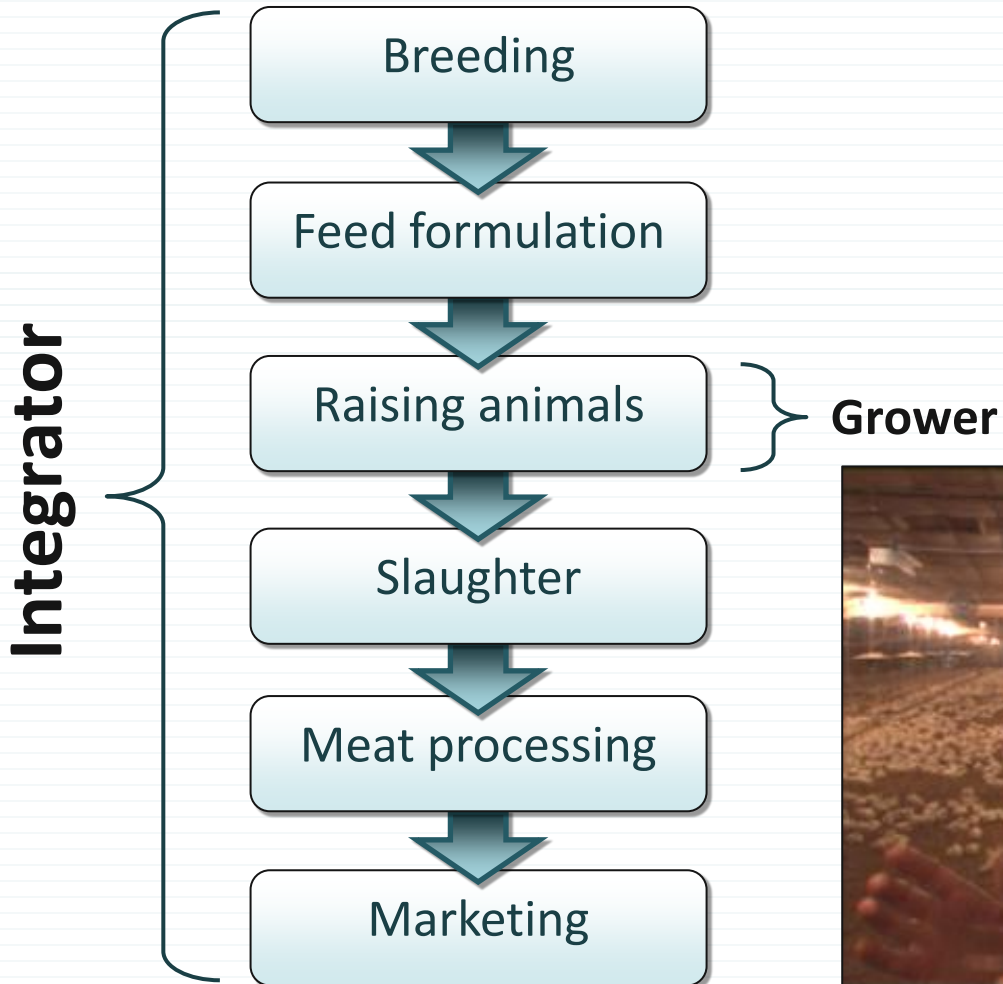


Image from the film *Out to Pasture: The Future of Farming?*  
Johns Hopkins Center for a Livable Future, MICA; 2011.





# Overview

Industrialization

Industry concentration

- **IFAP impacts**

Trends in consumption, production

Alternative production systems

Seafood harvest and production

Reflection



## IFAP impacts

# Economic benefits

- Greater production per area
- Lower prices of some animal products, partly due to:
  - Abundant feed crops
  - Weak enforcement of environmental regulations

## IFAP impacts to public health

# Wasteborne contamination



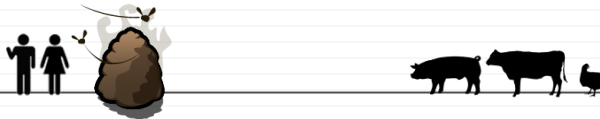
- Harbors pathogens, chemical contaminants
- Stored in lagoons and other containers
- Sprayed on nearby farmland as fertilizer

USDA NRCS. [photogallery.nrcs.usda.gov](http://photogallery.nrcs.usda.gov).

## IFAP impacts to public health

# Wasteborne contamination

(Images not to scale)



### Human waste

Generated each year: 7 million dry tons

Applied as fertilizer: 4 million dry tons

Kim B. Johns Hopkins Center for a Livable Future; 2011.

# IFAP impacts to public health

## Wasteborne contamination



Generated each year: 7 million dry tons

287 million dry tons

Applied as fertilizer: 4 million dry tons

270 million dry tons

Kim B. Johns Hopkins Center for a Livable Future; 2011.

# IFAP impacts to public health

## Wasteborne contamination



### Human waste (treated)

Generated each year: 7 million dry tons

Applied as fertilizer: 4 million dry tons

### Animal waste (untreated)

287 million dry tons

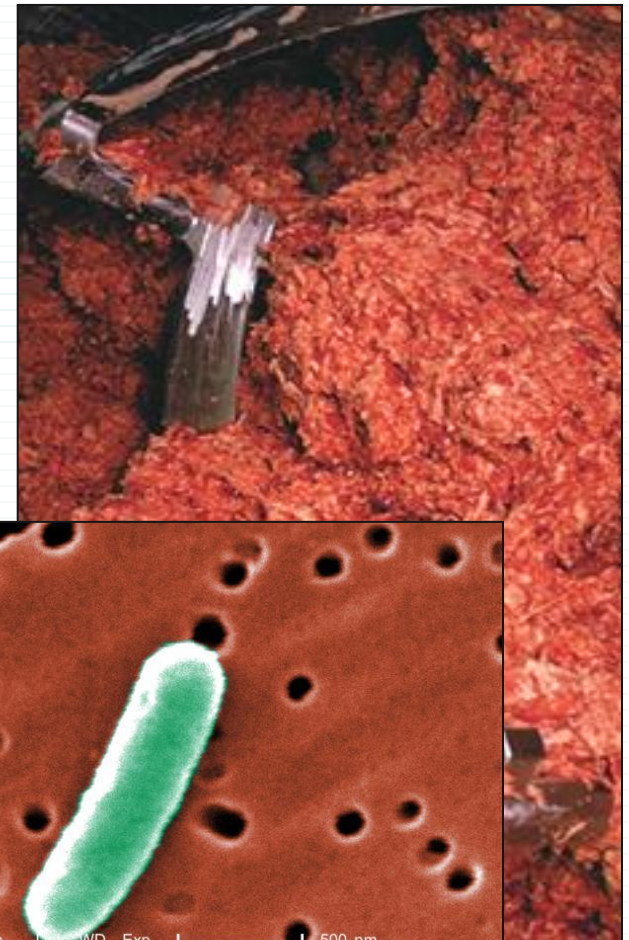
270 million dry tons

Kim B. Johns Hopkins Center for a Livable Future; 2011.

# IFAP impacts to public health

## Food safety

- Produce fertilized with untreated manure
- Slaughtering
- Processing
  
- Greater populations of *E. Coli* in grain fed cattle



*E. Coli* : Carr J. CDC; 2008. [phil.cdc.gov/phil/](http://phil.cdc.gov/phil/). Other images copyright.

# IFAP impacts to public health

## Occupational health

- Airborne contaminants
- Gases from animal waste
- Direct contact with animals



Poultry house: USDA. Available at Wikimedia Commons. Worker in Mexico: Nachman K. Used with permission.

# IFAP impacts to public health

## Rural communities



- Contaminated drinking water
- Eye, nose and throat irritation
- Asthma
- Nausea, diarrhea, headaches
- Depression, anxiety, anger, fatigue, confusion

Socially Responsible Agriculture Project. *High-pressure sprayers spread hog manure on farm fields near residential areas.* [www.sraproject.org](http://www.sraproject.org).



# IFAP impacts to public health

## Feed additives

- Antibiotics
- Rendered animals
- Animal waste
- Blood meal
- Animal fats
- Human food contaminated by rodent excreta
- Plastic pellets
- Municipal waste
- Etc.

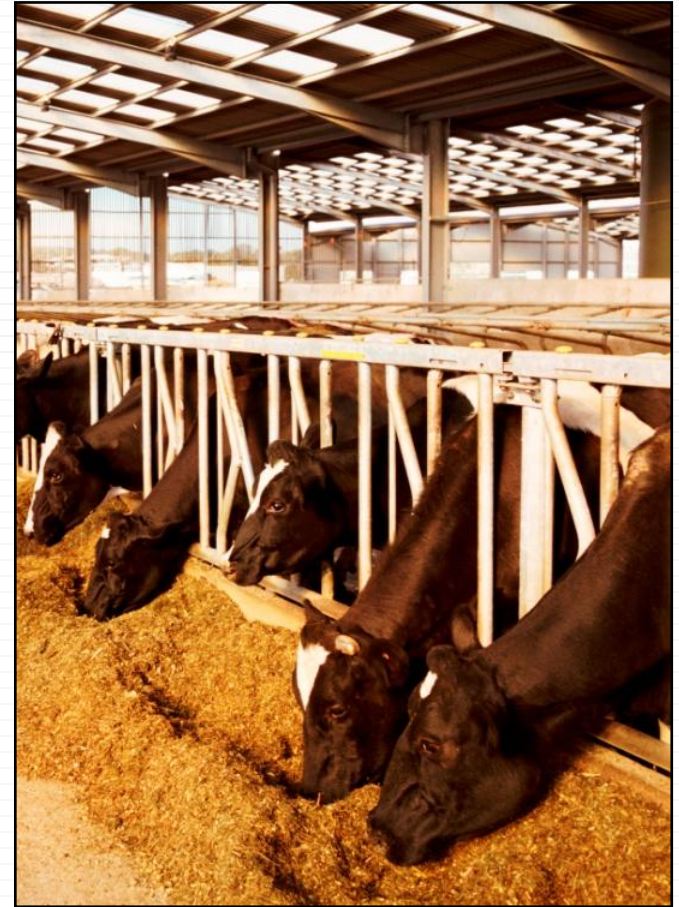
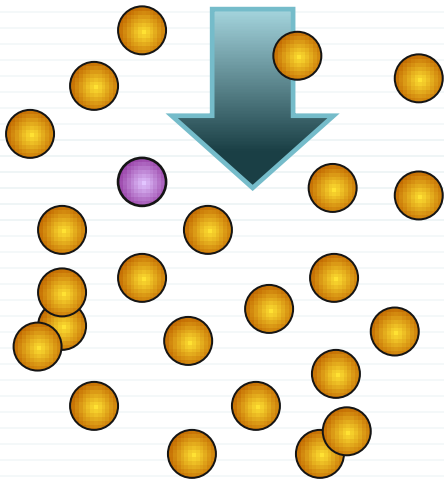


Image copyright.

# IFAP impacts to public health

## Antibiotic resistance

### *Antibiotics*

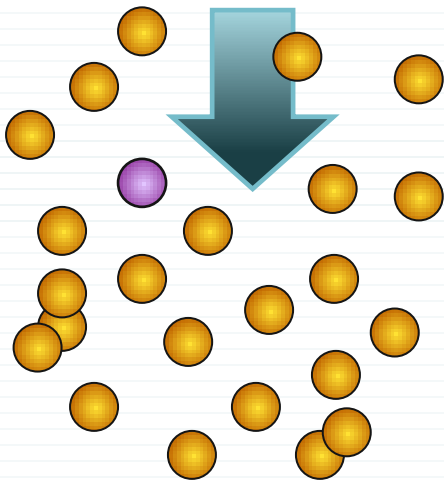


1. Pathogens are routinely exposed to antibiotics

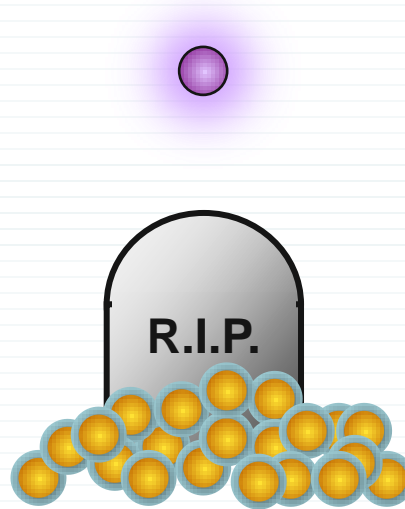
# IFAP impacts to public health

## Antibiotic resistance

### Antibiotics



1. Pathogens are routinely exposed to antibiotics

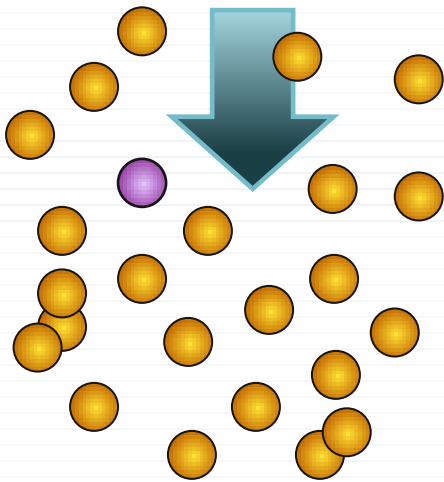


2. **Susceptible** pathogens die, **resistant** pathogens survive

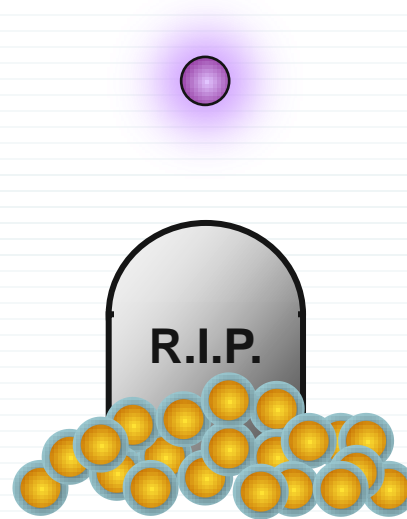
# IFAP impacts to public health

## Antibiotic resistance

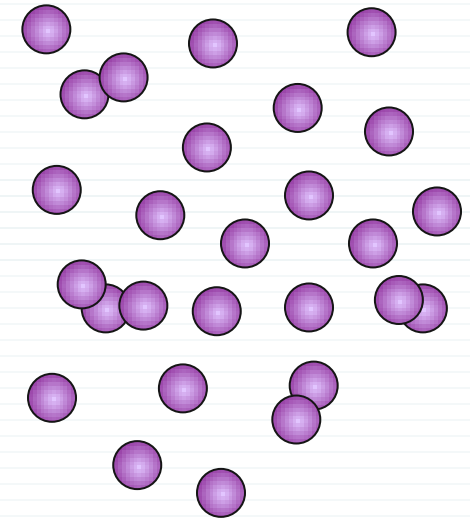
### *Antibiotics*



1. Pathogens are routinely exposed to antibiotics



2. **Susceptible** pathogens die, **resistant** pathogens survive

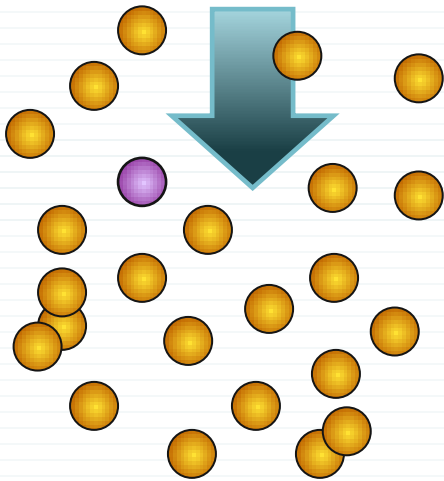


3. **Resistant** pathogens multiply

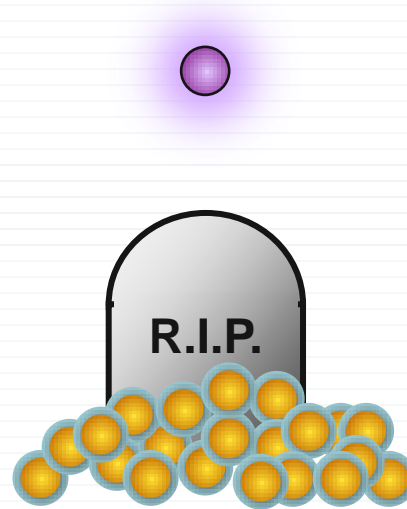
# IFAP impacts to public health

## Antibiotic resistance

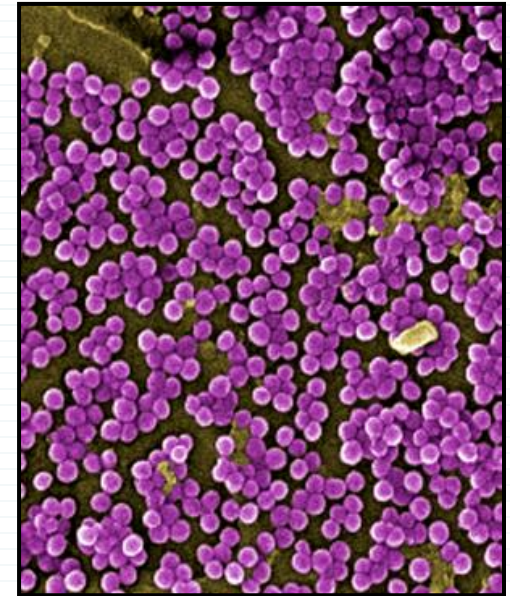
### Antibiotics



1. Pathogens are routinely exposed to antibiotics



2. **Susceptible** pathogens die, **resistant** pathogens survive

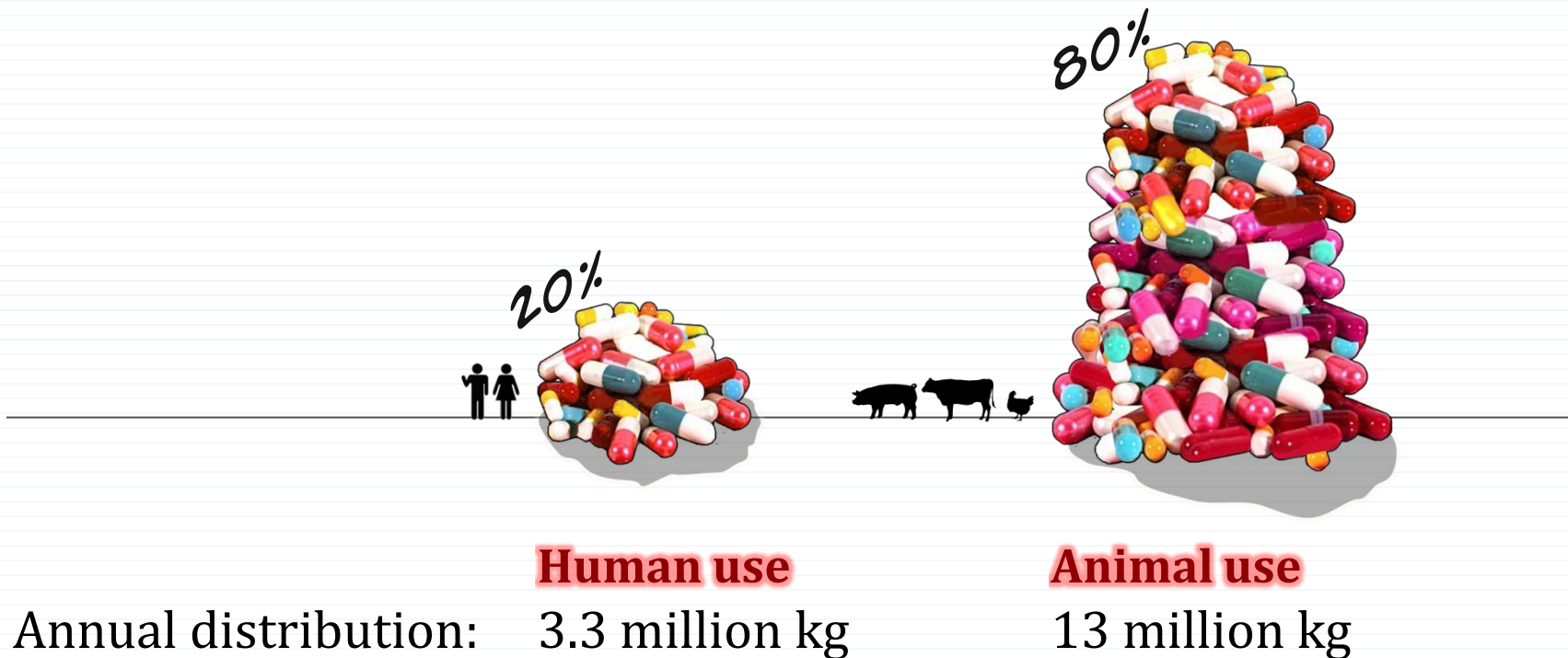


3. **Resistant** pathogens multiply

CDC, Public Health Image Library. MRSA.

# IFAP impacts to public health

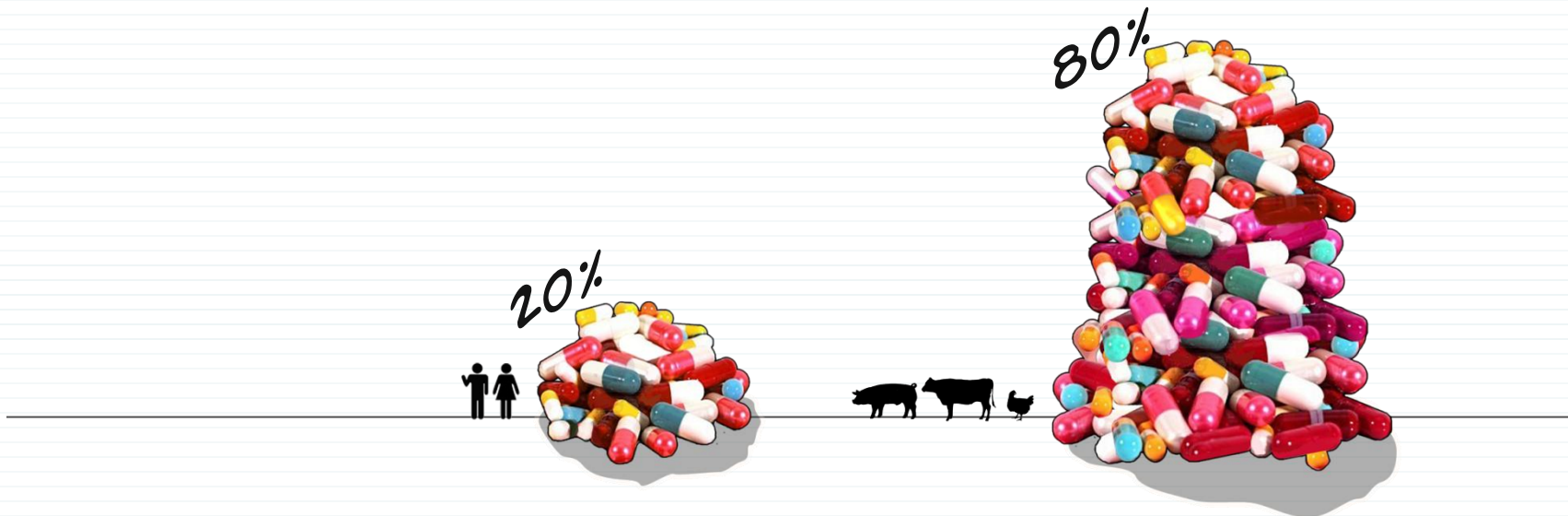
## Antibiotic use in the U.S.



Kim B. Johns Hopkins Center for a Livable Future; 2011.

# IFAP impacts to public health

## Antibiotic use in the U.S.



### Human use

Annual distribution: 3.3 million kg

Primary use: Treat disease

### Animal use

13 million kg

Promote growth

Kim B. Johns Hopkins Center for a Livable Future; 2011.

# IFAP impacts to the environment

## Nutrient pollution

- Manure sprayed on fields exceeds land's capacity to absorb it
- Manure storage may fail
- Algal blooms
- Dead zones
- Fish kills



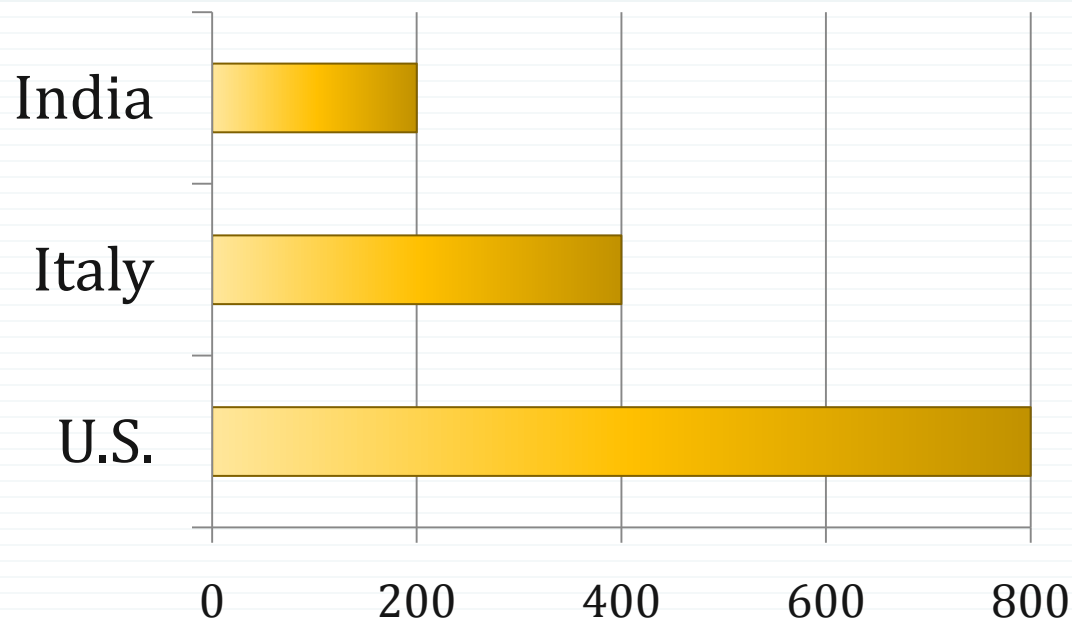
Manure sprayer: [USDA NRCS. photogallery.nrcs.usda.gov/](https://www.nrcs.usda.gov/photo-gallery/). Other images copyright.



# IFAP impacts to the environment

## Resource depletion

- Approximate grain consumption (kg) per person, per year:



Images copyright.

# IFAP impacts to the environment

## Resource depletion

- Estimated pounds of grain needed to produce a pound of meat:
  - Beef - 7:1
  - Pork - 4:1
  - Chicken - 2:1



Image copyright.

# IFAP impacts to the environment

## Resource depletion

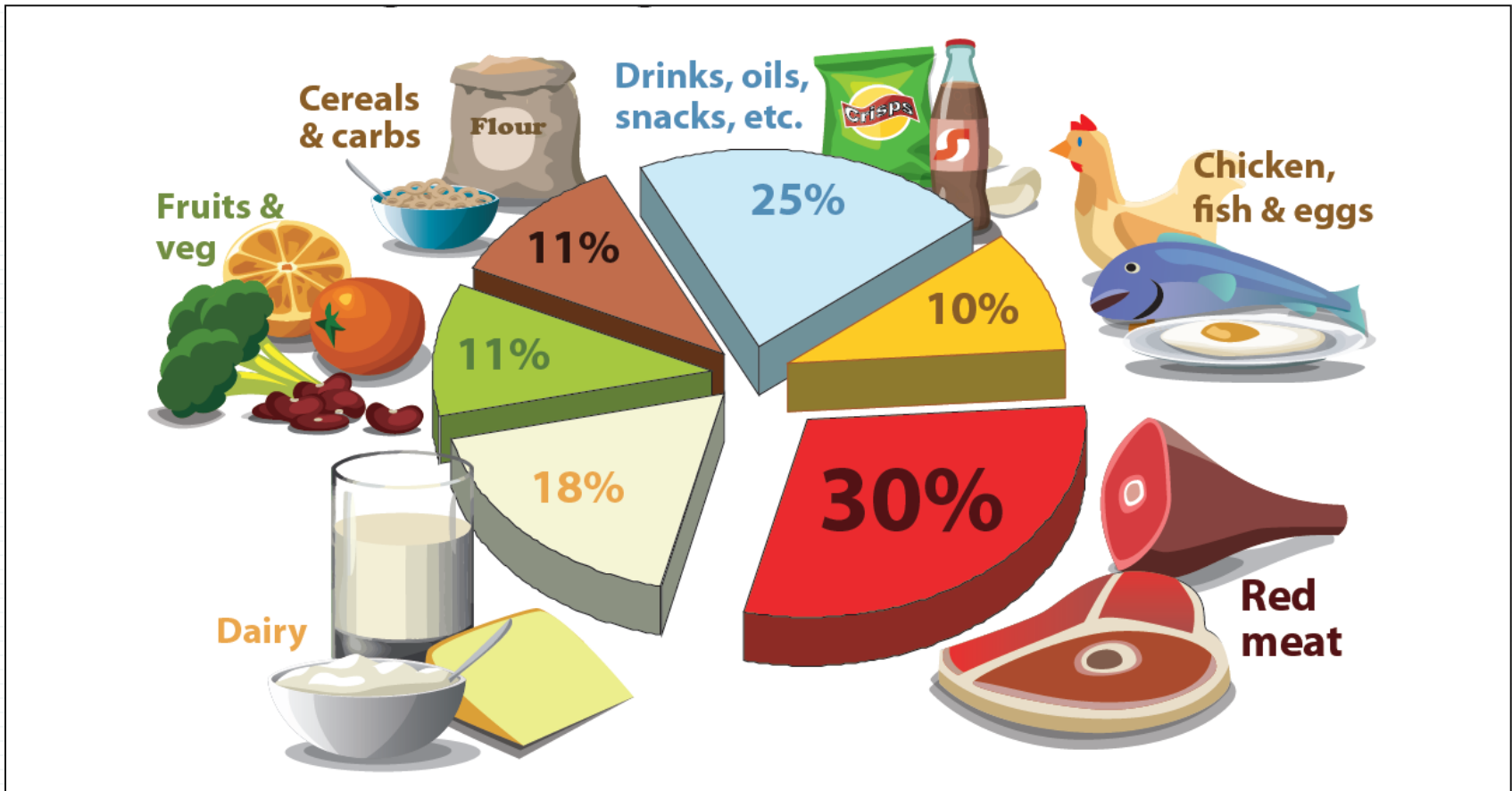


- Producing a quarter pound beef patty requires over 1,000 gallons of water

Images copyright.

# IFAP impacts to the environment

## Climate change



### Sources of GHG emissions from food production, transport and retail in the U.S.

Kim B. Johns Hopkins Center for a Livable Future; 2010. Adapted from Weber C L, Matthews HS. *Food-Miles and the Relative Climate Impacts of Food Choices in the United States. Environmental Science & Technology.* 2008;42 (10), 3508-3513.

# IFAP impacts to the environment

## Climate change

- Major contributors:
  - Cattle belching
  - Animal manure
  - Feed crop production



Manure lagoon: USDA NRCS. [photogallery.nrcs.usda.gov/](http://photogallery.nrcs.usda.gov/). Corn: USDA ARS. [www.ars.usda.gov/is/graphics/photos/](http://www.ars.usda.gov/is/graphics/photos/).

## IFAP impacts

# Rural economies

- IFAP:
  - Requires fewer workers
  - Relies less on local businesses
  - Workers earn low wages
  - Profits do not remain in the community



Socially Responsible Agriculture Project.  
[www.sraproject.org](http://www.sraproject.org).

# IFAP impacts

## Animal welfare



Laying hens in battery cages



Veal calf in crate



Sows in gestation crates

- Inability to perform natural behaviors
- Restricted movement
- Stress, anxiety
- Physical alteration without pain relief

Veal calf: Socially Responsible Agriculture Project. [www.sraproject.org](http://www.sraproject.org).

Battery cage hens, sows in gestation crates: Farm Sanctuary. [www.farmsanctuary.org](http://www.farmsanctuary.org). Free for non-profit use.



# Overview

Industrialization

Industry concentration

IFAP impacts

- **Trends in consumption, production**

Alternative production systems

Seafood harvest and production

Reflection



# Trends in consumption, production United States

## Food animals slaughtered annually:

Chickens:	8,789,000,000
Turkeys:	243,000,000
Hogs:	110,000,000
Cattle:	34,000,000
<b>Total:</b>	<b>9,200,000,000</b>



**U.S. population: 312,000,000**

Data source: USDA NASS. [www.nass.usda.gov/](http://www.nass.usda.gov/).

Images source: USDA ARS. [www.ars.usda.gov/is/graphics/photos/](http://www.ars.usda.gov/is/graphics/photos/).

## Trends in consumption, production

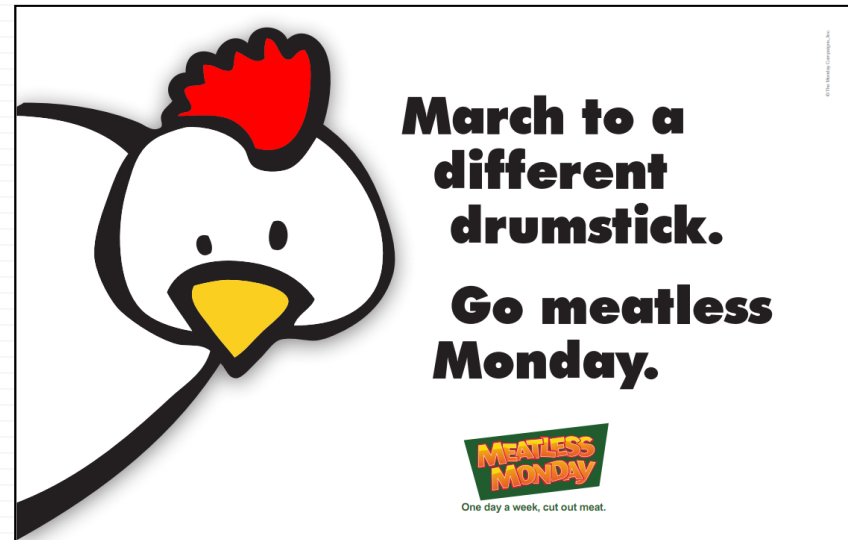
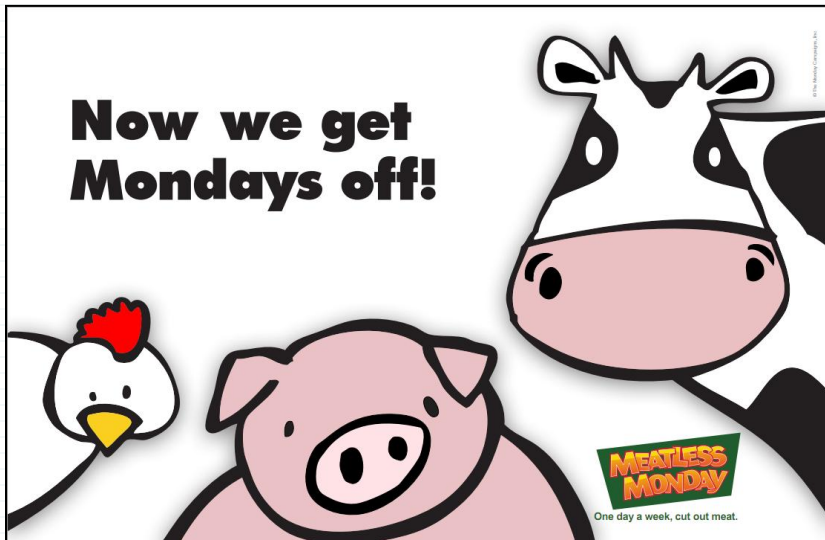
# Global

- 1997-2020: Global demand expected to rise by over 55 percent
- Per capita meat consumption in developing countries will remain below levels in developed countries
- IFAP model being exported internationally

# Trends in consumption, production

## Reducing consumption

- Reducing consumption of IFAP products by as little as once per week (15%) can reduce health, environmental, social and animal welfare harms



[www.meatlessmonday.com](http://www.meatlessmonday.com)



# Overview

Industrialization

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IFAP impacts

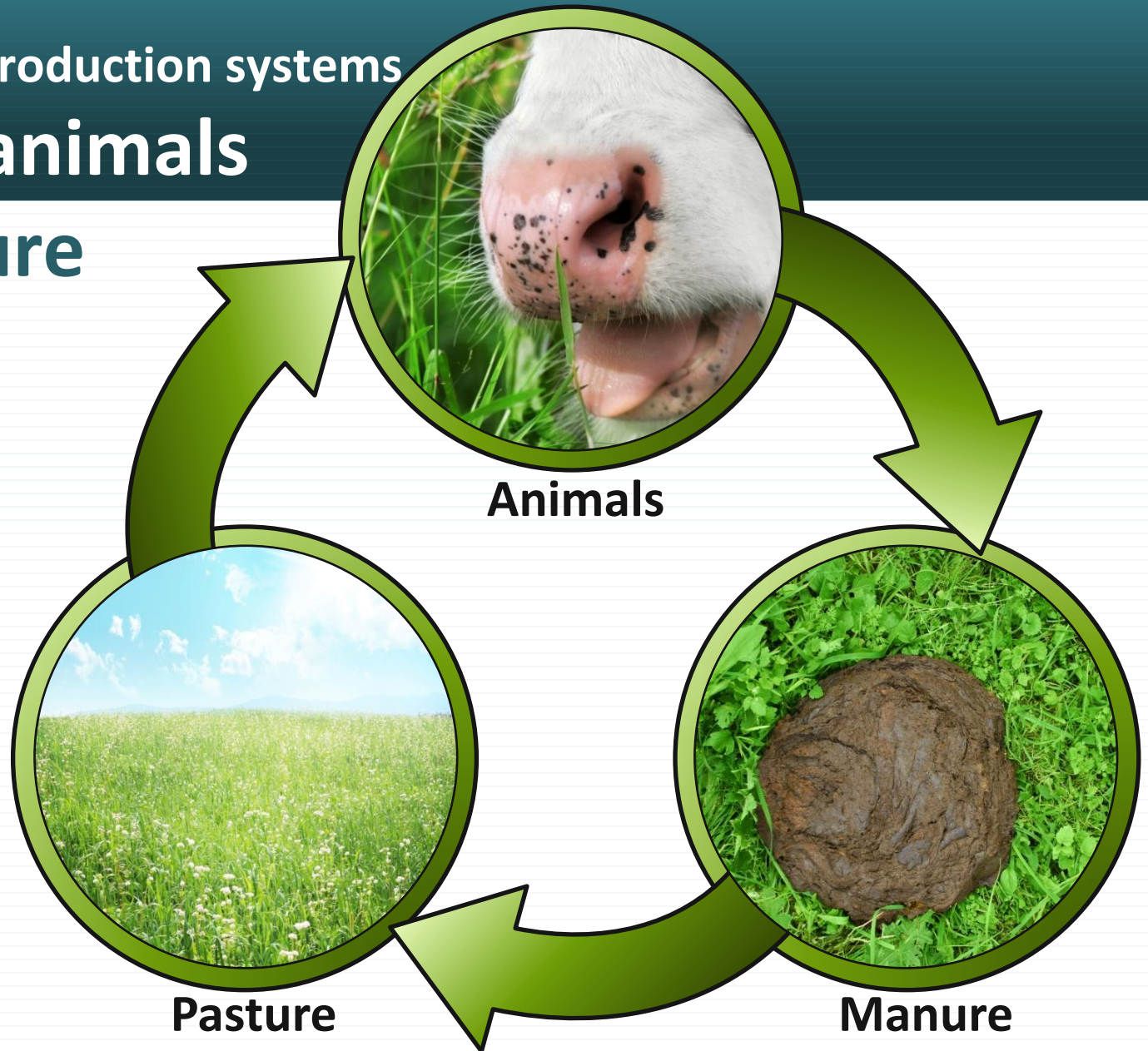
Trends in consumption, production

- **Alternative production systems**

Seafood harvest and production

# Alternative production systems

## Raising animals on pasture



Images copyright.

## Alternative production systems

# Benefits of raising animals on pasture

- Better tasting products
- Animals experience less stress
- Animals show lower rates of disease
- No growth promoting drugs
- Greater nutritional value



Image copyright.

## Alternative production systems

# Benefits raising animals on pasture

- Farmers have greater autonomy
- Farmers earn greater profits



Top: Heller M. Claggett Farm. Upper Marlboro, MD. Used with permission.

Left: Leiner K. *Growing Roots: The New Generation of Sustainable Farmers, Cooks, and Food Activists*. Photos by Andrew Lipton, Sunrise Lane Productions; 2010. Used with permission.

An underwater photograph showing a school of fish swimming in clear blue water. The fish are silvery and appear to be of various species, possibly including salmon or trout. The lighting is bright, creating a clear view of the fish and their movements.

# Overview

Industrialization

Industry concentration

IFAP impacts

Trends in consumption, production

Alternative production systems

- **Seafood harvest and production**

Reflection



# Seafood harvest and production

## Wild-caught seafood



U.S. Fish & Wildlife Service. [www.fws.gov/digitalmedia/](http://www.fws.gov/digitalmedia/).

- Wild sources (rivers, lakes, oceans) rapidly being depleted
- 52% of commercial ocean fish stocks fully exploited
- Some fish are harvested from the wild sustainably

# Seafood harvest and production

## Aquaculture

- Farming of aquatic organisms for food
- Uses tanks, ponds, open ocean pens
- 2006: accounted for 47% of global seafood



Salmon



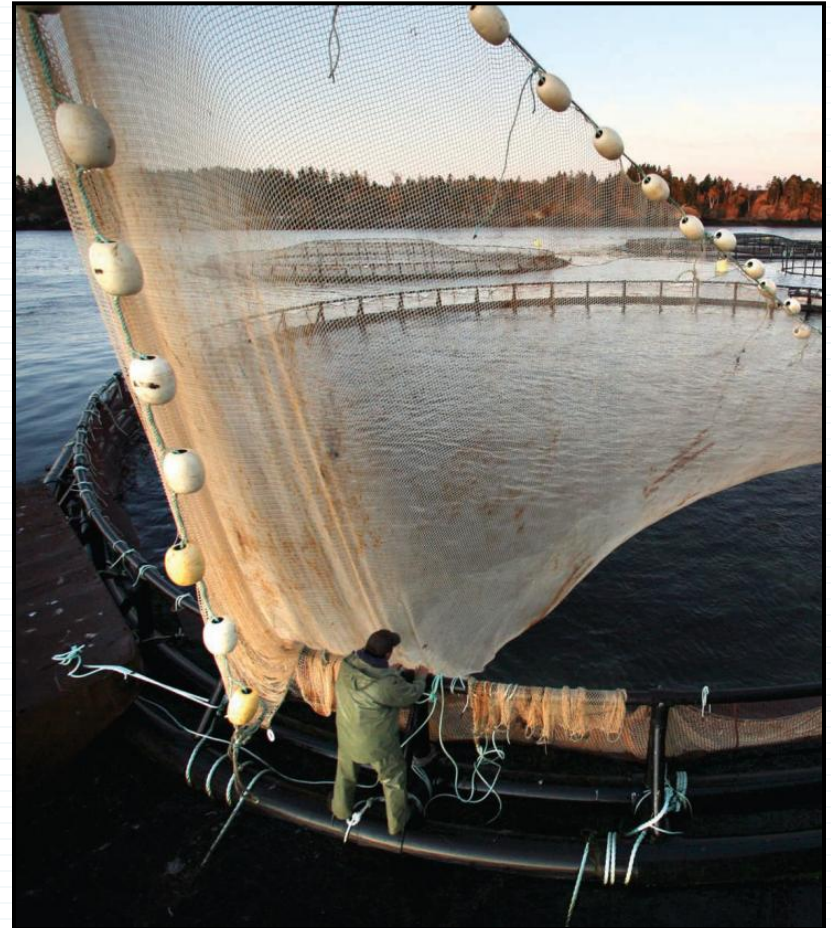
Shrimp

Images copyright.

# Seafood harvest and production

## Open ocean aquaculture

- Depletes stocks of smaller fish to feed farmed fish (carnivores)
- Water pollution from concentrated waste
- Farmed fish escape into wild, compete for resources



Environmental Health Perspectives. [ehp03.niehs.nih.gov/article/fetchArticle.action?articleURI=info:doi/10.1289/ehp.117-a252](https://ehp03.niehs.nih.gov/article/fetchArticle.action?articleURI=info:doi/10.1289/ehp.117-a252) .

# Seafood harvest and production

## Open ocean aquaculture

- Cramped conditions lead to use of antibiotics
- Impacts surrounding aquatic life
- Drug residues accumulate in meat



Salmon farm in Tasmania. Image copyright.

# Seafood harvest and production

## Alternative systems



- Recirculating aquaculture systems (RAS):
  - Closed-loop: Fish waste used as fertilizer
  - Maximizes production in a small area of land



# Overview

Industrialization

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■ **Reflection**

# Think – pair – share

“I tell ‘em it’s actually the cheapest food you can buy...”

- *Joel Salatin*



Walling S. Joel Salatin holds a hen during a tour of Polyface Farm. 2010. Creative Commons. Available at Wikimedia Commons. .

# Think – pair – share

“I tell ‘em it’s actually the cheapest food you can buy...”

- *Joel Salatin*

“...With our food all of the costs are figured into the price. Society is not bearing the cost of water pollution... antibiotic resistance, of food-borne illnesses, or crop subsidies... of all the hidden costs to the environment and the taxpayer that make cheap food *seem* cheap.”



Walling S. Joel Salatin holds a hen during a tour of Polyface Farm. 2010. Creative Commons. Available at Wikimedia Commons. .