Overview

1. Brief history of the food system
2. Characteristics of today's industrialized food system
   - Focused on producers
3. Special aspects of food products
4. Case study of the frozen foods manufacturer Birds Eye
Pre-History Humans

- **Paleolithic Era** – 26 million BP (years before present) to 10,000 BP
  - Ends at the dawn of agricultural
- Man develops tools and fire use, lives in small groups
- Many believe that paleolithic humans lived a life of leisure (this is controversial)
- Food was procured through hunting and gathering
- Famine was rare
- Our species evolved to function in the paleolithic environment
  - 10,000 years is not enough time to time to make an evolutionary difference

*Thus the paleolithic diet is a useful benchmark in evaluating the quality of diets*
Paleolithic Diet

- Comprised entirely of meat, fish, nuts, fruit, vegetables, eggs, insects, honey, breast milk
- Fewer carbohydrates

Percent Calories by Macronutrients of Typical Paleolithic Humans

<table>
<thead>
<tr>
<th></th>
<th>Paleolithic Humans</th>
<th>Modern US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>27% (19-35%)</td>
<td>15.4%</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>33% (22-40%)</td>
<td>51.8%</td>
</tr>
<tr>
<td>Fats</td>
<td>42% (59-25%)</td>
<td>32.8%</td>
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</tbody>
</table>
72.1% of our calories were not available

Our nutrition detectors—tastes—are ill-adapted to our modern food environment

Food markets were non-existence due to
- lack of surplus
- lack of storable food products

Marketing was limited to bartering between families

### Food and Food Types Found in Western Diets Generally Unavailable to Preagricultural Hominins

<table>
<thead>
<tr>
<th>Food or Food Group</th>
<th>Value</th>
<th>% of Energy²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole milk</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Low-fat milk</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>Butter</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10.6</td>
<td></td>
</tr>
<tr>
<td>Cereal Grains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole grains</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>Refined grains</td>
<td>20.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>23.9</td>
<td></td>
</tr>
<tr>
<td>Refined Sugars</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sucrose</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>High-fructose corn syrup</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Syrups</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18.6</td>
<td></td>
</tr>
<tr>
<td>Refined Vegetable Oils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salad, cooking oils</td>
<td>8.8</td>
<td></td>
</tr>
<tr>
<td>Shortening</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>Margarine</td>
<td>2.2</td>
<td></td>
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<tr>
<td>Total</td>
<td>17.6</td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>1.4</td>
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<tr>
<td>Total energy</td>
<td>72.1</td>
<td></td>
</tr>
<tr>
<td>Added salt, as sodium chloride</td>
<td>9.6³</td>
<td></td>
</tr>
</tbody>
</table>

¹ Data adapted from references 22–24.
² In the US diet.
³ Salt from processed foods, table salt use, and cooking; in g/d.
Neolithic Revolution: ~10,000 BCE

- Food marketing became relevant with the emergence of agrarian societies
  - Domestication of crops: 11,000 BCE in the fertile crescent
  - Domestication of animals: 6000 BCE
  - Widespread use of agriculture: 5000 BCE

- Large scale food marketing began when
  - sizeable surpluses were generated
  - storable varietals, e.g. wheat, allowed surpluses to be utilized across time
  - which allowed foods to be transported across space
  - sizable cities to form around the surpluses
Spread of Agriculture

Approximate limits of prehistoric agriculture (deserts, mountains etc. not differentiated)
Emergence of Civilization

- Agriculture resulted in
  - food surpluses
  - nonperishable food
  - population growth explosion
  - increased demand
  - technological advances
  - time for non-food production activities (art, government, etc)
  - government & laws
  - markets and trade

... Civilization
Money

- Emerged as a way to avoid barter-based exchange
- Money was originally backed by grain
  - You could trade a coin for a share of the harvest
- Facilitated trade
  - Great distances are spanned for spices and other foods.
- Facilitated markets
World Population

Figuring Out Agriculture

Widespread Ag Use

Agricultural Revolution

Industrial Agriculture
Source: Maddison Project
Agricultural Revolution: 1650-1850 CE

• World population doubles

• Increased ag production
  – New World crops introduced across the world
    • esp. corn and potato
    • turkey, tomato, peanuts, peppers, pineapple, beans, squash, chocolate,...
  – Developed distribution networks
  – Rise of US grain production
Agricultural Industrialization

- 1900s
  - Crop yields per acre dramatically rise
    - Largely due to synthetic fertilizers, and other tech advances
  - More land cultivated
  - World population doubles (again)
Modern Food System

- Food production has changed more in the last 100 years than it did in the previous 10,000 years

- Efficiency gains
  - Higher yields per acre
  - Lower food costs
  - Less labor
  - Prices have decreased
1. Specialized

- Before WWII, most US farms were diversified farms; i.e. produced many crops
- Today, monoculture dominates; i.e. typically 1 crop grown per farm
- Example: Beef Supply Chain is broken down into specialized industries
  - Breeding and birthing calves
  - Raising cattle on pasture
  - Growing feed crops
  - Storing and transporting grain
  - Transporting cattle
  - Finishing them in feedlots
  - Slaughtering them and processing their meat

- Results in greater efficiency by allowing producers to focus on fewer tasks, resulting in production becoming...
Industrialization of the Food System

Characterization of Modern Producers

2. **Simplified**
   - Specialization resulted in routine production processes allowing for production to be more...

3. **Mechanized**
   - Increased capital intensity
   - Since 1950 the average US farm has
     - doubled in acreage
     - but employs 1/8 as many workers.
     - This has resulted in a great deal of rural poverty
     - but also has allowed for huge efficiency gains allowing more mouths to be fed at lower prices
Industrialization of the Food System

Characterization of Modern Producers

4. **Standardized**
   - Specialized facilities, including farms, feedlots and processing plants, could work together more efficiently by adopting uniform practices and turning out products of uniform size, weight and consistency.
   - Outputs are identical, less varietals
   - Example: Chickens are now grown to a uniform size so they can be quickly slaughtered, plucked and processed into meat using mechanized assembly lines.
   - Fast food restaurants came to expect uniform cuts of meat that cooked evenly, fit between standardized sandwich buns, and meet consumer expectations.
   - Produce quality is the #1 way consumers select their supermarkets
     - Oddly shaped products are culled even if they’re good to eat
     - Example: 75% of culled cucumbers are removed by sorters because “there’s not much eye appeal to them.”
Industrialization of the Food System

Characterization of Modern Producers

5. **Consolidation**
   - Fewer, larger operations
   - Allows efficiency gains from economies of scale
   - Greater farm size allows for greater utilization of mechanical equipment.

   - Other players in the food chain have consolidated as well; e.g. supermarkets

   - Total production from vertically integrated farms:
     - 1960: 13%
     - 1994: 18%

Industrialization of the Food System

Characterization of modern producers

6. Greater use of off-farm inputs
   - synthetic fertilizers, chemical pesticides, antibiotics, hormones, fossil fuels
   - these off-farm input technologies allow for more predictable and reliable production
   - Monocultures require greater synthetic fertilizers and chemical pesticides
   - 1948-2008: agricultural chemical use quintupled
Industrialization of the Food System

Current Problems ... Marketing Opportunities

*Many trends in food marketing and consumer demand are responses to these problems*

1. Environmental degradation
2. Loss of food quality (some, not most)
3. Vulnerability to disease and pests
4. Animal welfare
5. Food waste
6. Rural poverty
7. Overconsumption, obesity, and metabolic syndrome
## Some Food Marketing Trends

<table>
<thead>
<tr>
<th>Trends</th>
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<tbody>
<tr>
<td>Organics</td>
</tr>
<tr>
<td>Health</td>
</tr>
<tr>
<td>Higher quality</td>
</tr>
<tr>
<td>More labels (health, nutrition, environment, etc.)</td>
</tr>
<tr>
<td>Locavore movement</td>
</tr>
<tr>
<td>Convenience</td>
</tr>
<tr>
<td>Heirloom varieties</td>
</tr>
<tr>
<td>Demand for regularly shaped produce</td>
</tr>
<tr>
<td>Low carb foods</td>
</tr>
<tr>
<td>GMO</td>
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<tr>
<td>Food Safety</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Trends</th>
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</thead>
<tbody>
<tr>
<td>Gluten free</td>
</tr>
<tr>
<td>Low fat diets (esp. saturated fat and omega-3's)</td>
</tr>
<tr>
<td>Folksy family farm motifs</td>
</tr>
<tr>
<td>Freshness</td>
</tr>
<tr>
<td>Higher calorie consumption / desire for less consumption</td>
</tr>
<tr>
<td>Obesity</td>
</tr>
<tr>
<td>Sustainable agriculture</td>
</tr>
<tr>
<td>Green</td>
</tr>
<tr>
<td>“Natural”</td>
</tr>
<tr>
<td>Free Trade</td>
</tr>
</tbody>
</table>
Take-Aways for the Food Marketer

• Much activity in food marketing are attempts at solving old problems and fulfilling fundamental consumer needs.

• Many of our diet-based health issues are related to a mismatch between the hunter gatherer diets and our modern ag-based diets.
  – There is a mismatch between what people want for health reasons and what their bodies’ tell them to eat.
  – This contradiction provides opportunities for food marketers.

• Many of the trends in food marketing are driven by consumer reactions to problems associated with industrial agriculture.
We’ve solved the quantity problem, it’s all about quality now
Special Aspects of Food Products

1. Nondurable
   - Food is no longer usable after just one use
   - When you use a chair, it doesn't get used up

2. Perishable
   - Food goes bad
   - Provides an additional dimension for product differentiation (e.g. fresh vs. frozen vs. canned)
   - Limits stockpiling behavior
   - Makes inventory management much more difficult
   - Makes warehousing food costly
   - Results in inelastic short-term supply
     - If you had a lot of lettuce ready for market, you would
     - supply it all no matter the price
Special Aspects of Food Products

3. **Scalable**
   - More than 1 unit often purchased at a time
   - Requires marketing in the quantity dimension
     - Multipacks, bulk
   - Allows for quantity discounts – aka **Second Degree Price Discrimination**

4. **Usage Variant**
   - Foods can be used in arbitrary amounts
   - Chairs are not usage variant because usages call for fixed quantities
   - Potato chips are usage variant because consumers snack on them in arbitrary amounts
   - At-home consumption rates can be manipulated by marketers
5. **High Frequency**

- Weekly or so

- People make 227 food decisions per day
  
  - 59 related to “what”
  
  - Implies Bounded Rationality – when an economic agent is unable to make a fully informed decision because they do not have the time or ability.

  - People use heuristic such as brand identification and habits to navigate so many decisions

- Suppliers and retailers must keep a constant flow of goods and services
6. **Necessary good**
   - As food consumption levels approach zero, the marginal utility of food goes to infinity.
   - Guarantees that:
     - the food market will always be large
     - by volume the food market will track populations

7. **Nutrition and Health**
   - Food is literally what we’re made of
   - Demand for food can be recast as demand for nutrients
   - Food security is a matter of (inter)national security
     - Higher levels of regulation than other industries
Special Aspects of Food Products

7. **Input to Household Production**
   - Most food products need to be further processed at home
   - Demand for food is dependent on household production technologies (e.g. recipes, refrigeration capacity)

8. **Cultural Significance**
   - Food is an important cultural identifier
     - Ethnic cuisine
   - Provides further opportunities for marketers to differentiate
   - Ex: Pork is forbidden to Jews
9. **Seasonality**

- Because food inputs are grown, their supply has a high degree of seasonality.
- This is felt throughout the food chain throughout the year.
- Because households get turned off by volatile prices, firms keep prices relatively stable.
  - Results in some parts of the year being more profitable than others.
Seasonality

Producers Price Index for Tomatoes
not seasonally adjusted

Consumers Price Index for Tomatoes
not seasonally adjusted

Source: www.bls.gov
More Special Aspects of Food

10. Food Can Kill You
   – Allergies / Food Contamination

11. Food Commodities Are Undifferentiated
   – Disconnects the link from the ag producer to the product
   – Is a big problem to the locavore movement

12. Food Availability Is a National Security Issue
   – “Every society is three meals away from chaos” – Vladimir Lenin
Case Study: Birds Eye

- Illustrates many of the changes in food markets and marketing over the last 100 years
- Hits on nearly every topic we will cover later in this course
- Discussion is *highly* encouraged
Case Study: Frozen Foods and Birds Eye

- **1912-1915**: Clarence Birdseye is taught by Inuits how to ice fish and freeze his catch instantly using ice, wind, temperature, and notes their fish is of better quality and keeps better than frozen fish back home.

- **1920s**: Birdseye develops quick freezing methods which results in less mushy, freezer burnt foods. Nutritionally superior to other technologies.

- **1926**: Birdseye’s company (General Seafoods) is valued at $3 million based on the promise of his technology.

- **1929**: Goldman Sachs and Postum Company (Post as in the cereals) buys Birds Eye company and patents for $23.5 million.
  - Becomes General Foods and forms Birds Eye Frozen Food Company.

- **1930s**: Birdseye *tests consumer response* in retail stores in MA.
  - The birth of the modern frozen food industry
  - Initial products included many meats, seafood, spinach, peas, and many fruits.
Case Study: Frozen Foods and Birds Eye

- **1930s-1960s**: The requirements of frozen food technology requires crops to be harvested and frozen immediately. This required farming mechanization—humans could not harvest fast enough.
  - Birds Eye initially owned equipment and rented it out to farmers (*why rent?*)
  - **Standardization** required for Birds Eye processing and expected by consumers.
  - Birds Eye is responsible for **improvements** in vegetable varieties, cultivation techniques, and harvesting equipment.
  - Frozen foods are **premium** and have **high own-price elasticities**.

- **1930s-present**: Farm gate and processing costs decrease with modern technological advances. Allows for **lower retail prices**.

- **1944**: Birds Eye **vertically integrates** by developing a national distribution system and leases refrigerated boxcars (*why lease?*)
Hurry! Hurry! These peas need to be processed within 90 minutes!
Case Study: Frozen Foods and Birds Eye

- **1950s**: *Supermarkets emerge* as the dominant grocery retail in part because they can/will house frozen food sections. Getting retailers to house expensive freezer cabinets was a major obstacle that was overcome only by demonstrating with *data* the *expected return on investment*.
  - Decided not to rent cabinets out themselves (*why?*)
  - Persuaded a refrigerator manufacturer to make display cabinets suitable for grocery retailer purchase.
  - *Retailer willingness* to be an outlet for frozen foods, not consumer demand, is the limiting factor for growth

- **1950s-present**: Birds Eye continues *vertical integration* by acquiring producers. *Horizontally integrates* by acquiring direct frozen food competitors and other food manufacturers such as potato chips.
Case Study: Frozen Foods and Birds Eye

- **1950s-1960s**: 3 big players emerge: Birds Eye, Findus and Ross, each owned by bigger companies (Unilever, Nestle, and Imperial Group).
  - Other players *imitate*, only Birds Eye *innovates*. *Return on capital investment*: 16% to 9% to 4%.
  - *Brand* strength of Birds Eye so strong, others find it not profitable to advertise.
  - Lack of brand recognition and manufacturing *price advantage* leave competitors no choice but to follow Birds Eyes prices.

- **1955**: *Commercial introduction of TV*. Birds Eye is far ahead of its competitors in advertising.
  - “Birds Eye *added values* beyond the physical and functional ones that contributed to a clear and likeable *personality for the brand*.”
Case Study: Frozen Foods and Birds Eye

- **1955-1956**: Birds Eye introduces the frozen chicken pot pie and fish fingers.

- **1956-1981**: Sales grow by 15% per year. Introduction of many *new product lines* to benefit from *differentiated products*.

- **1958**: Birds Eye *enters* broiler chicken industry.

- **1950s-present**: Birds Eye offers *discounts to retailers* with ample Birds Eye freezer space, high volumes, and large/frequent deliveries and to “achieve a consistent level of gross profitability from various consumers.”
  - Discounts exceed short-term savings by Birds Eye (*why would they do that?*)
Case Study: Frozen Foods and Birds Eye

- **1960s**: 1/3 of all whitefish are frozen. *Contracts* with frozen food industry begin to replace open auction fish markets.

- **1960s**: Supermarkets introduce *private label* frozen foods, made feasible by the development of the *hub-and-spoke retail distribution system*. Freezer cabinet space expanded.

- **1960s**: *Independent wholesalers* connect manufacturers to caterers by providing *distribution* and *logistics*. 
Case Study: Frozen Foods and Birds Eye

- **1960s-1970s**: Many newcomers enter the market as **technological advances** make quick freezing machines **inexpensive**.
  - *Marketing-only firms emerge* that buy from manufacturers and sell their own **brands**.
  - *Specialist firms emerge* that provide storage, freezing, transportation, distribution, and even processing services.
Case Study: Frozen Foods and Birds Eye

• **1970s**: In response to the *rising power of retailers*, *Birds Eye refocuses its marketing on customers and suppliers.*

• **1970s**: *Birds Eye streamlines its distribution* and manufacturing facilities and cuts overhead. *Merges* with an ice cream company (*why?*)

• **1975**: Frozen food industry is the biggest customer of green vegetables.
  - ½ of all peas and ¾ of all green beans are frozen.
Case Study: Frozen Foods and Birds Eye

- **1988-2009**: A bunch of *mergers* of Birds Eye’s *parent company*. Birds Eye is seen as a *valuable brand name*.

- **1976-2010s**: Expansion of product “*sub-brands*” such as Birds Eye Voila! ready made meals, desserts, and specialty dishes marketed to capture *growing demand for convenient, organic, and premium frozen meals*.
  
  - These product lines have *higher margins* and face less *competition*.
  
  - Reflects evolving *consumer needs* *(what needs?)*
Birds Eye’s Early Problems

<table>
<thead>
<tr>
<th>Value Chain</th>
<th>Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm</td>
<td>quality; irregular produce; lack of equipment; risk</td>
<td></td>
</tr>
<tr>
<td>Birds Eye</td>
<td>need deliveries to be continuous and quick;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>costly; tech. new/nonexistent; location;</td>
<td></td>
</tr>
<tr>
<td>Warehouses &amp; Wholesalers</td>
<td>doesn’t exist; costly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>limited availability, costly; risk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>doesn’t exist; costly</td>
<td></td>
</tr>
<tr>
<td>Retailer &amp; Caterers</td>
<td>lack of freezer cabinets; space; risk; lack of demand;</td>
<td></td>
</tr>
<tr>
<td>Consumer</td>
<td>unfamiliarity; lack of freezers; perceptions; affordable</td>
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