PROCESSING WASTE MANAGEMENT AND BY-PRODUCT UTILIZATION

ALS 3133

Agriculture and Environmental Quality

4. **Textiles**
   a. **Wool and cotton -- washing, gin dust, dyes**
   b. **Synthetic fibers -- synthetic organic chemicals**
5. **Paper products -- odors and strong wastewaters (wood industry?)**
6. **Industrial chemicals -- furfural from bagasse, wood molasses**

Overview

1. **What are "processing wastes"? Sources?**
2. **What are <u>food</u> processing wastes, and what are the sources of waste in the "food system"?**
3. **Why do we "process" food?**
4. **What are some of the waste management problems in the food processing industries?**
5. **How are food processing wastes treated or utilized?**
6. **Energy use in the food system**

II. Food Processing

(What is "processing"?)

Largest industry in U.S.

Large losses of organic matter from:

a. **Washing (Egg washing, for example)**
b. **Cutting**
c. **Peeling**
d. **Blanching**

I. Sources of "Processing" Wastes

processing agricultural commodities to:

1. **Foods -- concentrate on these in class, more later**
2. **Feeds – dust, grains, food processing wastes**
3. **Leather -- cleaning hides and tanning**

Distribution of wage and salary employment in food manufacturing by industry segment, 2006
(Employment in thousands)

Industry segment	2006 Employment
Food manufacturing, total	1,484
Animal slaughtering and processing	509
Bakeries and tortilla manufacturing	280
Fruit and vegetable preserving and specialty food manufacturing	177
Dairy product manufacturing	132
Sugar and confectionery product manufacturing	75
Grain and oilseed milling	60
Animal food manufacturing	50
Seafood product preparation and packaging	40
Other food manufacturing	160

Variety

a. **Walk up and down the grocery store aisle!!**

b. **Each product has a different and unique waste and management problem**

Processed vs. Fresh

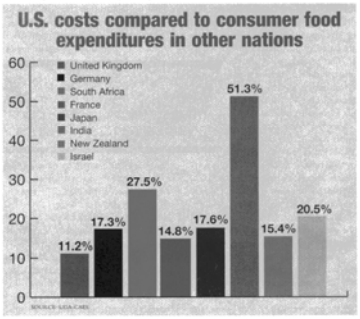
Which is more environmentally friendly?

Which is more nutritious?

US -10.2%

U.S. food dollar buys more

Currently, U.S. consumers spend a very low percentage, only 10.2%, of their disposable income for food. The percentage of disposable income spent on food 11 years ago, in 1980, was 13.2%.



Farmers receive about 20% of the consumers' food dollar. Most of the other 80 cents consists of: off-farm labor, 39 cents; packaging, 8.5 cents; transportation, 4 cents; advertising, rent and profits, 4 cents each; energy, depreciation and business taxes, 3.5 cents each.

Why Process Foods?

a. **Convenience**

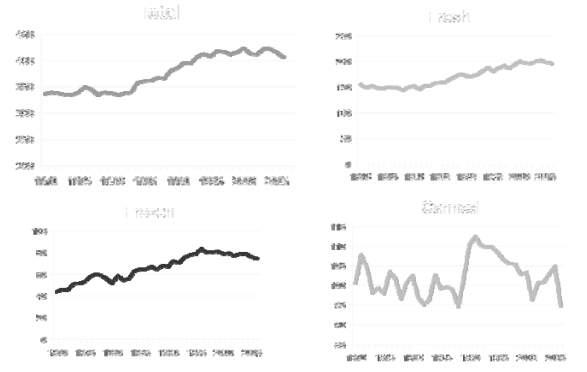
b. **Variety -- nutrition**

c. **Preservation**
   1. **Prevent spoilage**
   2. **Disease prevention -- pathogens**

d. **Economics**

e. **Less waste? (Field or Home? Packaging?)**

Vegetable Consumption



Food Waste -- the "Food System"

a. **Field (also increased utilization of resources?)**
b. **Processing Plant**
c. **Transportation**
d. **Retail-Wholesale**
e. **Home**

Types of Problems and Wastes

a. Organic wastes
   (1) Water quality
       Nutritional (nutrients), other
   (2) Air quality
       Odor, dust, other
   (3) Solid waste

b. Packaging materials
   (1) Cost
   (2) Disposal
   (3) Energy and resource requirements

d. Small plants
   1. Cost
   2. Regulatory problems

e. Uncertain production costs
   1. Raw material availability
   2. Raw material cost

http://ca.youtube.com/PlanZeroOntario

IV. By-product Utilization

a. Profit or added revenues
b. Cost reduction -- partially offset current disposal costs
c. Segregation at source can help
d. Separation of solids from effluent (remember the processing component?)
e. Water reduction -- waste in more useable form
f. Pretreatment charges

III. Characteristic Problems of Food Processing Industries

a. High organic loads
   1. Rapid degradation
   2. Effect on municipal treatment plants or design of industrial treatment plants

b. High nutrient content -- after all, they came from food

c. Seasonal loads -- some cases, such as vegetable canning

Examples of By-product Utilization

a. Animal feed ingredients
b. Hydrolyzed hog hair
c. Wood molasses
d. "Fish Dust"
e. Worm feed
f. Industrial chemicals -- furfural from bagasse, wood C_4H_3OCHO
g. ethanol

http://www.youtube.com/watch?v=JfSmdM_1baQ

V. Treatment and Handling Systems for Processing Wastes

a. **By-products**
b. **Treatment plants**
    - **Municipal sewage treatment plant**
    - **Industrial**
    - **Joint industrial-municipal**
c. **Spray irrigation system**
d. **Lagoon systems**
e. **Overland flow systems**

What Is a Biorefinery?

A biorefinery is a facility that integrates biomass conversion processes and equipment to produce fuels, power, and chemicals from biomass.

- analogous to petroleum refineries, which produce multiple fuels/products from petroleum.
- most promising route to the creation of a new domestic biobased industry.
-take advantage of the differences in biomass
- maximize the value

for example, produce one or several low-volume, high-value chemical products and a low-value, high-volume liquid transportation fuel, while generating electricity and process heat for its own use/for sale of electricity. The high-value products enhance profitability, the high-volume fuel helps meet national energy needs, and the power production reduces costs and avoids greenhouse-gas emissions.