



FNH 200- Exploring our Food (Jan-Apr 2014)

- Instructor: **Azita Madadi-Noei**
- Rm 217 Food, Nutrition & Health
Building-2205 East Mall
- **Tel.** (604) 822-2806
- Email: **Connect internal email**
- Office Hrs: **by appointment**



My background

- B.Sc. Nutrition and Dietetics
 - *Food Irradiation*
 - *Novel Computer Applications in Nutrition and Dietetics*
- M.Sc. Food Science and Technology
 - *Application of Biotechnology in Food*
 - *Formulation of New Fermented products from Feta Cheese Whey using Lactic Acid Bacteria*
- Ph.D. Food Science,
 - *Anti-invasive Activity of Bovine Colostrum and Whey Proteins Against *Salmonella* Typhimurium*



My background (Industrial training)

- Pasteurized milk and dairy products
- Soft drink processing plant
- Baker's yeast processing plant (Red Star)
- Meat processing plant
- Confectionery products Company
- Canned food company
- Vegetable oil processing plant
- Food and Drug Inspection
- Cheese production research station



Courses

- Undergraduate:
 - FNH200
 - FNH302
- Graduate courses:
 - FOOD 510-Advnces in Food Science
 - FOOD 524-Advances in Food Processing
 - FOOD 521-Advances in Food Biotechnology
 - FOOD 529-Laboratory methods in Sensory Evaluation
 - FOOD 511-Master of Food science Workshop



My Teaching Philosophy



FNH 200

EXPLORING OUR FOOD



Course Objectives and Outcomes

- Describe **key concepts** of food science
- Articulate personal values **rationalizing your choice** of food purchase/consumption
- **Critically evaluate** and form your own opinion on issues pertaining to food



Resources – required

- Connect is used for this course:
 - Lessons, assigned readings & quizzes
 - Campus Wide Login (CWL)

- Course Resources on Connect:
 - Login at:

<http://elearning.ubc.ca/connect/login-to-connect/>



Resources – required

- Course Outline (syllabus)
- Course Content: Lessons 1-13
- Lecture notes
- Assignments
- Videos
- Quizzes
- Announcements made through the “Discussion tool”



What you should check everyday on Conecct:

- Course Content (Lessons)
 - Review prior to coming to the class
 - Compile/Print lessons (*optional*)
 - Please note that lessons will be released as they are being reviewed and updated
 - Check posted messages in Connect
- Class slides
 - Review/Print – add notes
- Announcements made through the Discussion tool
 - *From your instructor to all students*



Resources - supplementary

- Reference Book:

- “Food Science”.

- By N. N. Potter and J. H. Hotchkiss. Aspen Publishers Inc., Chapman & Hall, 5th edition, 1995, 1998. Available in Woodward Library

- “Essentials of Food Science

- By Vaclavik, Vickie and Christian, Elizabeth W (online)

- Videos (will be viewed in some classes)

- Videos can not be borrowed or incorporated into lessons



Evaluation

• Assignments (2)	12%
• Quizzes (4)	10%
• Midterm exam	33%
• Final exam	<u>45%</u>
<i>Total</i>	<i>100%</i>

- *Bonus mark for contribution (1 mark)*



Assignments deadline & topic

	<i>Date</i>	<i>Topic</i>
Assignment 1 (6 marks)	4:30 PM Feb 11 th	Food product trends- consumer demands; food labeling regulations, function of ingredients and additives
Assignment 2 (6 marks)	4:30 PM March 25 th	Food processing and preservation methods



Evaluation

- On-line quizzes (4):
 - Each quiz: 25 multiple choice questions on Connect
 - Accessible on selected Fridays 2:00pm till Sunday 11:00 pm (please check the dates on course syllabus in Connect)
 - Limited time: **25 min** to complete it
 - Only be taken once
 - No extensions whatsoever



On-line discussion/Class contribution

- Two discussion topics will be posted in your group folder and you need to have at least two postings in two different days to qualify for 0.5 mark for each discussion
- It is encouraged to post any course related question on the designated folder. Those who correctly contribute to answering the question (at least 3 posts) will be eligible for 0.5 mark



Evaluation

- Mid-term Exam (Feb 25th)
 - 50 min long
 - L. 1-4
 - Memory Aid: **ONE** (1) 8.5 x 11" sheet SINGLE sided (font size above 6-typed/hand written)
- Final Exam (TBA)
 - 2.0 hrs long- L.1-13
 - Memory Aid: **ONE** (1) 8.5 x 11" sheet DOUBLE sided (font size above 6-typed/hand written)



Evaluation- Midterm...

- Midterm exam will not be handed back
 - Grades will be uploaded (“*My Grades*”)
 - **Midterm feedback** will be provided as well as assigned “*midterm-viewing hours*”

Memory aid must be handed in with the midterm and final exam paper



Course content

- Please consult with the schedule provided in the course syllabus and read the lessons prior to coming to the class



Questions?



Lesson 1

Food Science & the Canadian Food System



Lesson 1 Food Science & the Canadian Food System

OBJECTIVES

- Describe the field of food science
- Describe the breadth and relative magnitude of various sectors of the Canadian food industry
- Illustrate how food is distributed to consumers in Canada
 - how apples are converted to a variety of food products
- Identify and reflect trends in food consumption in Canada



What is Food Science?

How does it differ from and Nutrition?




What is Food Science?

- Food Science is the application of basic principles of science & engineering to study and acquire new knowledge on physical, chemical and biochemical aspects of food.



What is Food Science?

- Food Science is the application of basic principles of science & engineering to study and acquire new knowledge on physical, chemical and biochemical aspects of food.
- Food Technology utilizes the information gathered by food science, and applies the appropriate technologies to ensure quality and safety of food.



Are *Food Science* and *Nutrition* the same?

- Nutrition - effects of food in the person who consumes them
- Food science - study chemical, microbiol., physical, and sensory properties of foods & their ingredients during processing and storage...

Murano, P.S. (2003)



Food Science

- Multidisciplinary
 - Chemistry
 - Physics
 - Analysis
 - Microbiology
 - Processing
 - Engineering

Food Science discoveries

Canning

- Nicholas Appert
 - French confectioner
- In 1795, Napoleon offered 12,000 francs for a new way of preserving food.



Nicholas Appert
(c.1806)

Food Science discoveries

Canning

- Nicholas Appert
 - French confectioner
- In 1795, Napoleon offered 12,000 francs for a new way of preserving food.
- 1st prize!
 - by placing food in bottles, corking them, and then heating the bottles in a water bath.



Nicholas Appert
(c.1806)

Food Science discoveries

Nicholas Appert discovered :
Heat processing **results in** longer shelf life
and initiated the **canning** technology.



Can of "roast
veal" (c. 1824)



19th century can
of soup (c.1856)

Food Science discoveries

Observation”

- In 1900s, Clarence Birdseye
 - on an expedition in Labrador for the U.S Geographic Service
- Fish meat **exposed** to the Arctic air was still tender and fresh tasting even when cooked months later.
- Common freezing methods at that time did not result in a high quality product



Clarence
Birdseye

Food Science discoveries



Clarence
Birdseye

Conclusion

- Rapid freezing of fish in extremely low temperatures preserved the quality of fish much better than the conventional freezing method

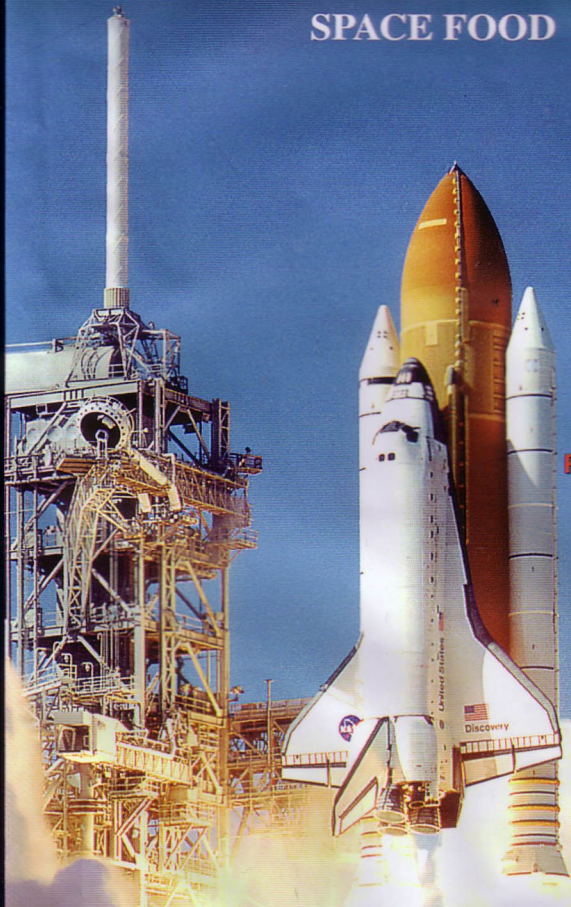


Food Science discoveries

- *Other discoveries?*
 - UHT & Tetra pak
 - HTST pasteurization

FREEZE-DRIED ICE CREAM

CHOCOLATE • VANILLA • STRAWBERRY
SPACE FOOD



READY TO EAT

TEAR HERE

Nutrition Facts

Serving Size 1 Package (21g)

Amount Per Serving

Calories 120 Calories from Fat 50

% Daily Value*

Total Fat 6g **9%**

Saturated Fat 4g **20%**

Cholesterol 25mg **8%**

Sodium 50mg **2%**

Total Carbohydrate 15g **5%**

Dietary Fiber 0g **0%**

Sugars 12g

Protein 2g

Vitamin A 4% • Vitamin C 0%

Calcium 8% • Iron 0%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

Calories: 2000 2500

Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

INGREDIENTS: Milkfat, Sugar, Nonfat Milk, Corn Syrup, Strawberry Puree (strawberries, high fructose corn syrup, sugar, modified potato starch, red #40), Whey, Cocoa (processed with alkali), Mono and Diglycerides, Guar Gum, Cellulose Gum and Carrageenan, Artificial Flavor, Red #40, Blue #1, and Annatto Color.



MADE FROM REAL ICE CREAM
DELICIOUS CHOCOLATE,
VANILLA AND STRAWBERRY

Originally developed for the early Apollo Missions, this "space treat" is frozen to -40°F (-40°C), then vacuum dried and placed in a special polyfoil pouch. Freeze-dried foods are used by astronauts eating under weightless conditions in space.

Inner paper wrapper is slit to facilitate processing.

READY TO EAT
NO REFRIGERATION NEEDED



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Food Science discoveries

- *Other discoveries?*
 - UHT & Tetra pak
 - HTST pasteurization
 - Freeze drying (space foods!)
 - Instant noodles, instant pudding
 - Dehydrated foods
 - Vacuum packaging
 - Spreadable margarines ...



○ Video Time...(5 minutes)

- <http://www.ift.org/knowledge-center/learn-about-food-science/world-without-food-science.aspx>
- (1.29 min)
- <http://www.ift.org/Knowledge-Center/Learn-About-Food-Science/Day-In-The-Life/Michele-Perchonok.aspx>
- (3.39 min)

- <http://www.ift.org/Knowledge-Center/Learn-About-Food-Science/Day-In-The-Life/Fuhung-Hsieh.aspx>
- (3.39 min)



Canada's Food System



Canada's Food System

- 3 meals/day = 1095 meals/year
- 9.3% household expenditure spent on food
Steadily decreasing since 1960s (18.7%)
- Total annual value of product shipment by the food manufacturing industry in Canada is approximately **\$86 billion**

Average household food expenditure, (Canada)

	2010	2011
Food expenditures \$	7,823	7,795
Food purchased from stores	5,693	5,588
Bakery products	577	560
Cereal grains and cereal products	356	337
Fruit, fruit preparations and nuts	713	669
Vegetables and vegetable preparations	615	623
Dairy products and eggs	896	860
Meat	1,026	1,017
Processed meat	375	381
Fish and seafood	199	202
Non-alcoholic beverages and other food products	1,311	1,320
Food purchased from restaurants	2,130	2,207

Source: Statistics Canada, CANSIM, table [203-0028](#) and Catalogue no. [62F0026M](#).

Last modified: 2013-01-30

<http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil132a-eng.htm> 44

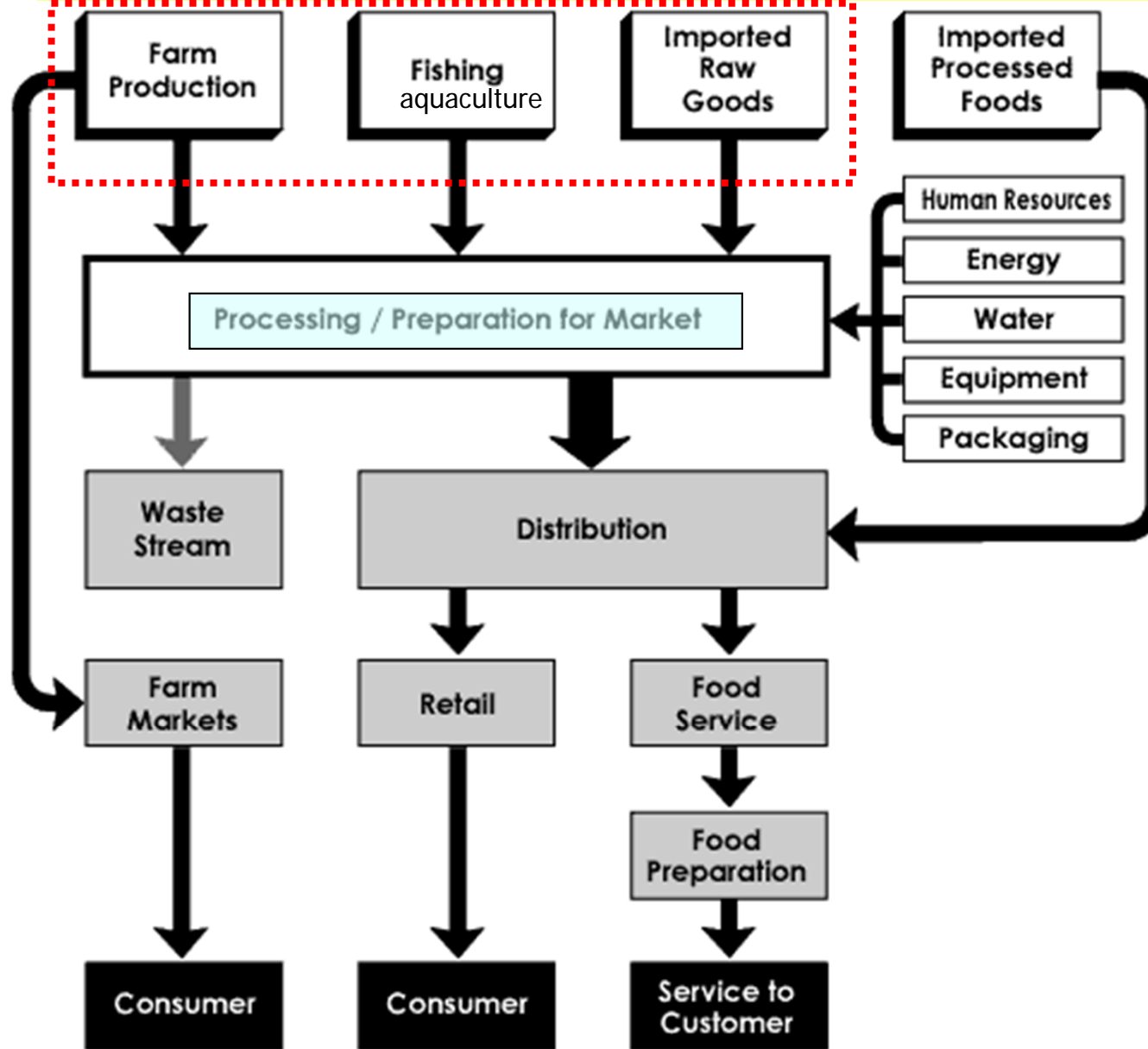


Canada's Food System

- In 2011, Canadian consumers spent slightly more than \$270 billion on food and beverages (including alcohol) in retail stores and foodservice operations
- Canadians spent \$190 billion in grocery stores, \$77 billion in various foodservice outlets

Figure 1.1

(1) primary agricultural production (in Canada or elsewhere)



Primary production (agriculture) of raw materials in Canada

Food Commodity	Province
Animal (beef, poultry, pork)	
Dairy milk	
Cereals, grains	
Tree fruits; small fruits; berries (cran, rasp, blue)	
Vegetables	
Seafood	

Primary production (agriculture) of raw materials in Canada

Food Commodity	Province
Animal (beef, poultry, pork)	Widespread around Canada
Dairy milk	Across Canada, Ontario, Quebec
Cereals, grains	Alberta, Saskatchewan, Manitoba
Tree fruits; small fruits; berries (cran, rasp, blue)	British Columbia; Ontario, Nova Scotia; Almost every province; British Columbia
Vegetables	All across Canada
Seafood	Atlantic Canada and British Columbia

Figure 1.1

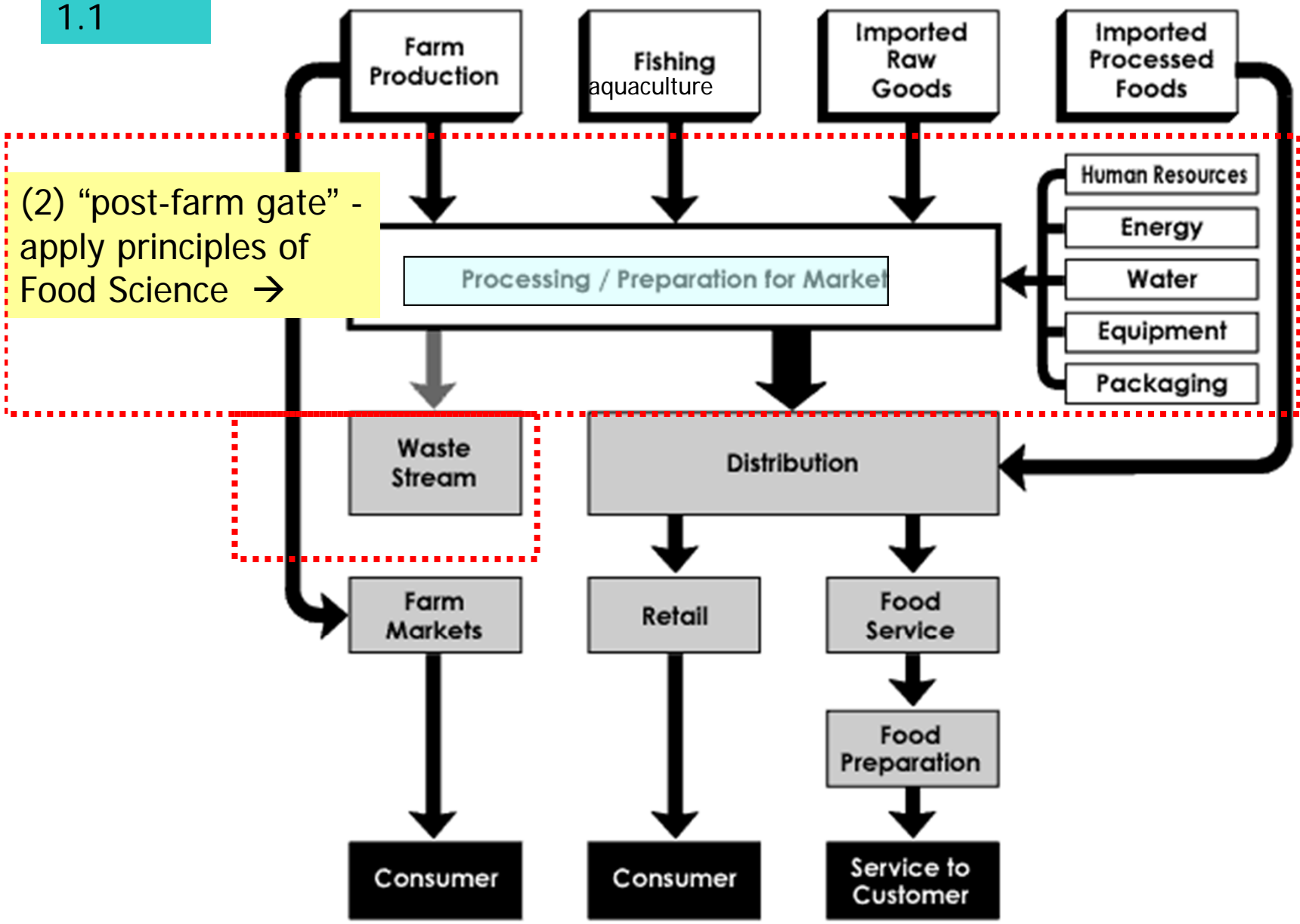
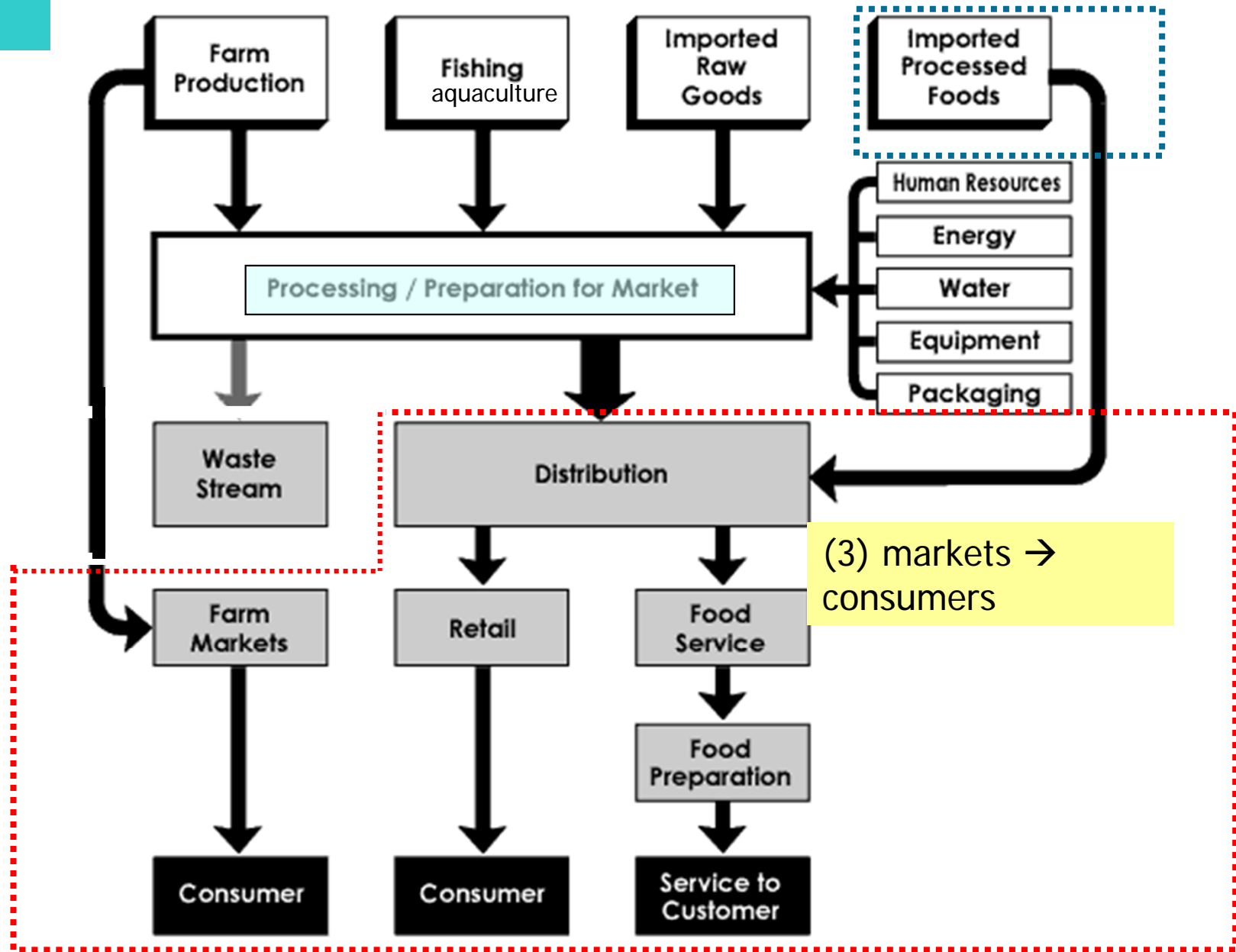


Figure 1.1





Canada's Food System

- Some products are sold to consumers with little processing
 - eg. fresh fruits, vegetables, and
 - also available as processed products (eg canned, dried, frozen, fermented,....)



The Canadian Food Industry

- Size and Scope

- How does the food industry contribute to the Canadian economy?
- What is the relative value of different commodity types?

Commodity Consumption	2009	2010	2011
Total fruits 4 , 8	86.34 ^(T)	85.41 ^(T)	(T)
Total vegetables 4 , 9	99.71 ^(T)	97.99 ^(T)	(T)
Total vegetables (excluding potatoes) 4 , 9	72.32 ^(T)	61.54 ^(T)	(T)
Oils and fats	17.60 ^(T)	16.80 ^(T)	(T)
Cereal products	55.81 ^(T)	53.91 ^(T)	(T)
Alcoholic beverages, total population (litres per person, per year)	82.21 ^(T)	18.74 ^(T)	
Fluid milk (litres per person, per year)	57.22 ^(T)	54.90 ^(T)	(T)
Total cheeses	10.16 ^(T)	10.15 ^(T)	(T)
Red meats, boneless weight	23.38 ^(T)	22.22 ^(T)	21.70 ^(T)
Poultry, boneless weight	13.50 ^(T)	13.42 ^(T)	13.37 ^(T)
Eggs (dozens per person, per year)	12.70 ^(T)	12.96 ^(T)	13.28 ^(T)
Fish 6	5.67 ^(T)	5.29 ^(T)	5.97 ^(T)
Pulses and nuts	6.93 ^(T)	7.20 ^(T)	(T)
Sugars and syrups	23.70 ^(T)	22.24 ^(T)	(T)

Critical Thinking:

How does this image from a trading store (ca. 1910) compare to a typical grocery store (supermarket) of today





? Most popular fruit in Canada = ?

- Bananas, apples, oranges ~ 50%
- Berries becoming more popular
- less processed fruits in 2009 (change from 2008)

? Most popular vegetable in Canada = ?

- Potatoes ~ 44%
- Exotic vegetables increasing popularity
- Total calorie consumption decreased

Apple Processing

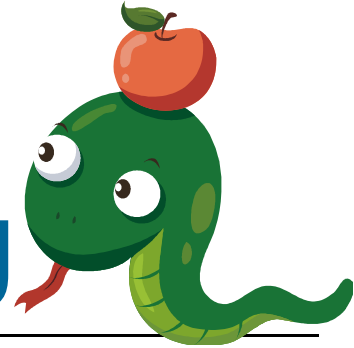
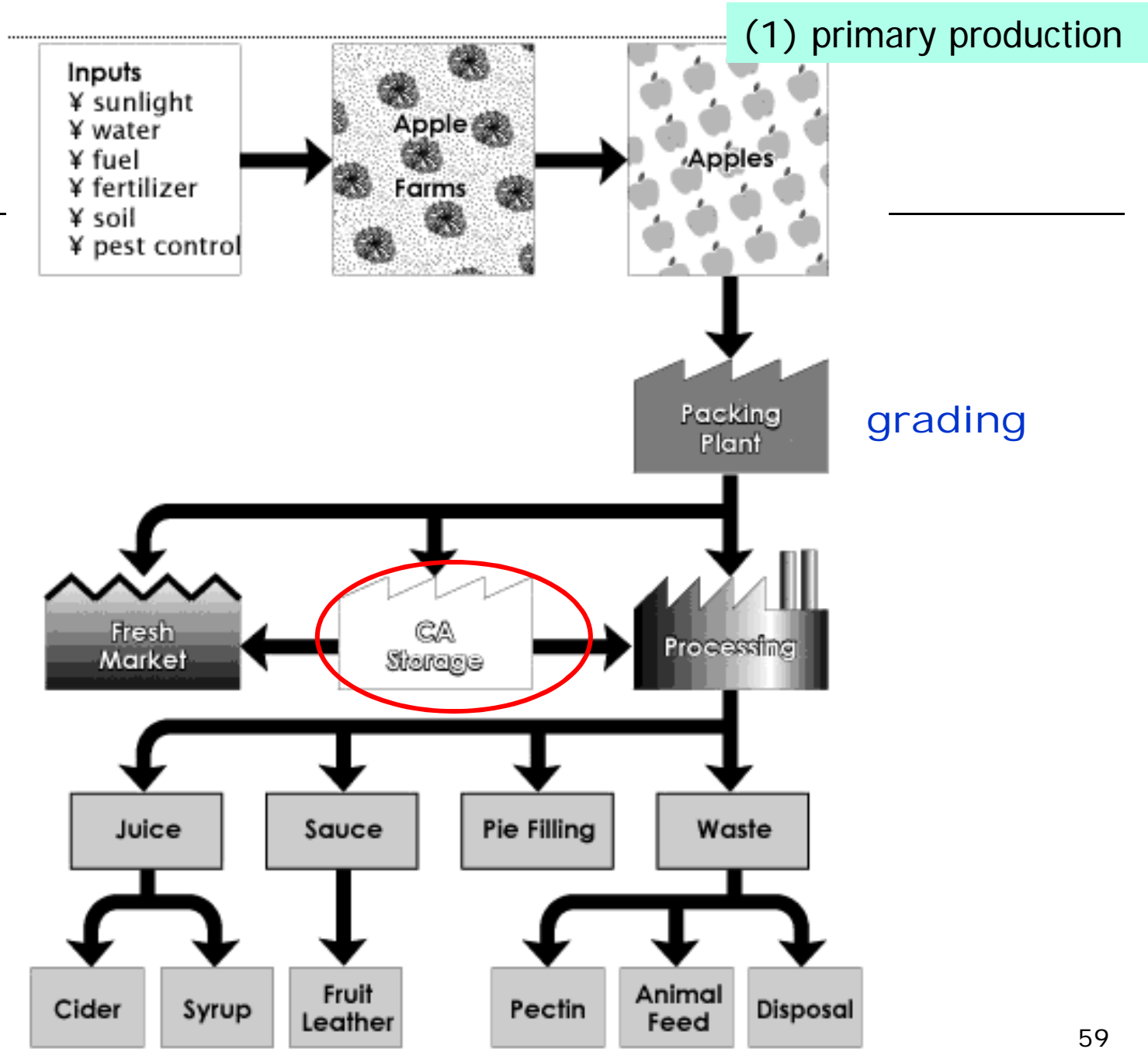


Fig. 1.2





Controlled Atmosphere (CA) storage

- Slow down respiration rate & ripening process (↓ senescence)
- Extending storage life (**for months**)
- Exact conditions depend on the type of fruit & variety (eg var. of apple)



Example of CA- storage: McIntosh apples, optimal storage

1. Temperature ($\sim 3^{\circ}\text{C}$)
2. Humidity (87%)
3. Atmosphere (gases):

3% O_2 3% CO_2 94% N_2

After 1 month:

3% O_2 5% CO_2 92% N_2

Up to 10 months in CA, *vs*
6 months in air at opt T, RH



Example of CA- storage:
McIntosh apples, optimal storage

CA-gases mixture:

3% O₂ 3% CO₂ 94% N₂



Example of CA- storage:
McIntosh apples, optimal storage

CA-gases mixture:

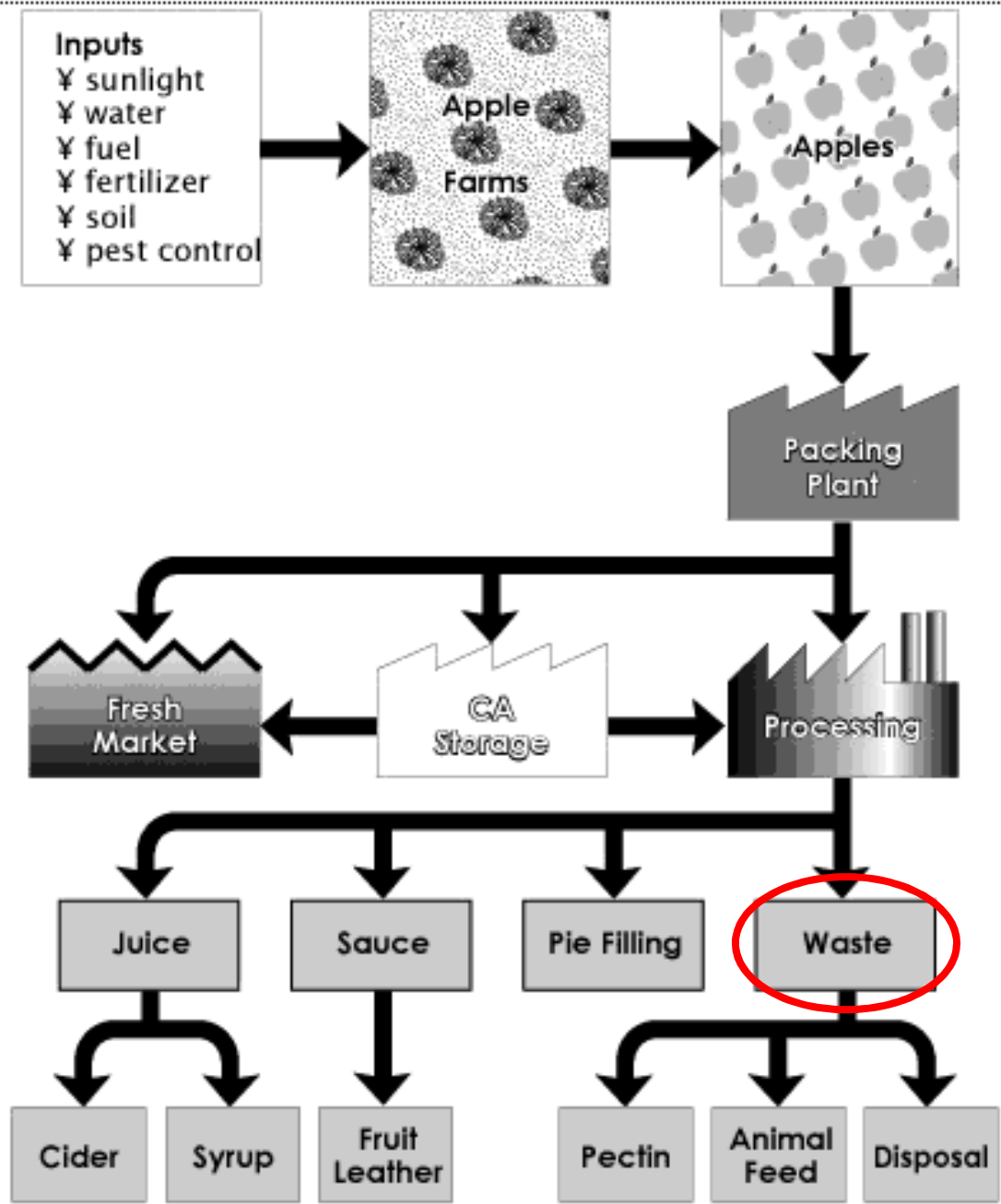
3% O₂ 3% CO₂ 94% N₂

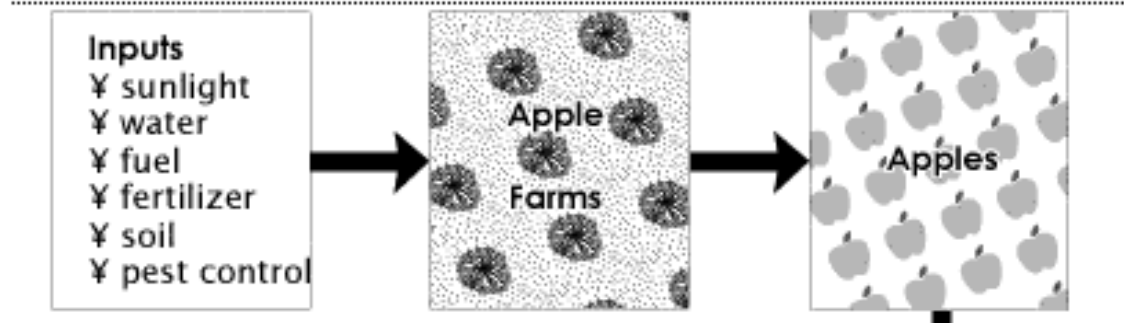


Inert gas

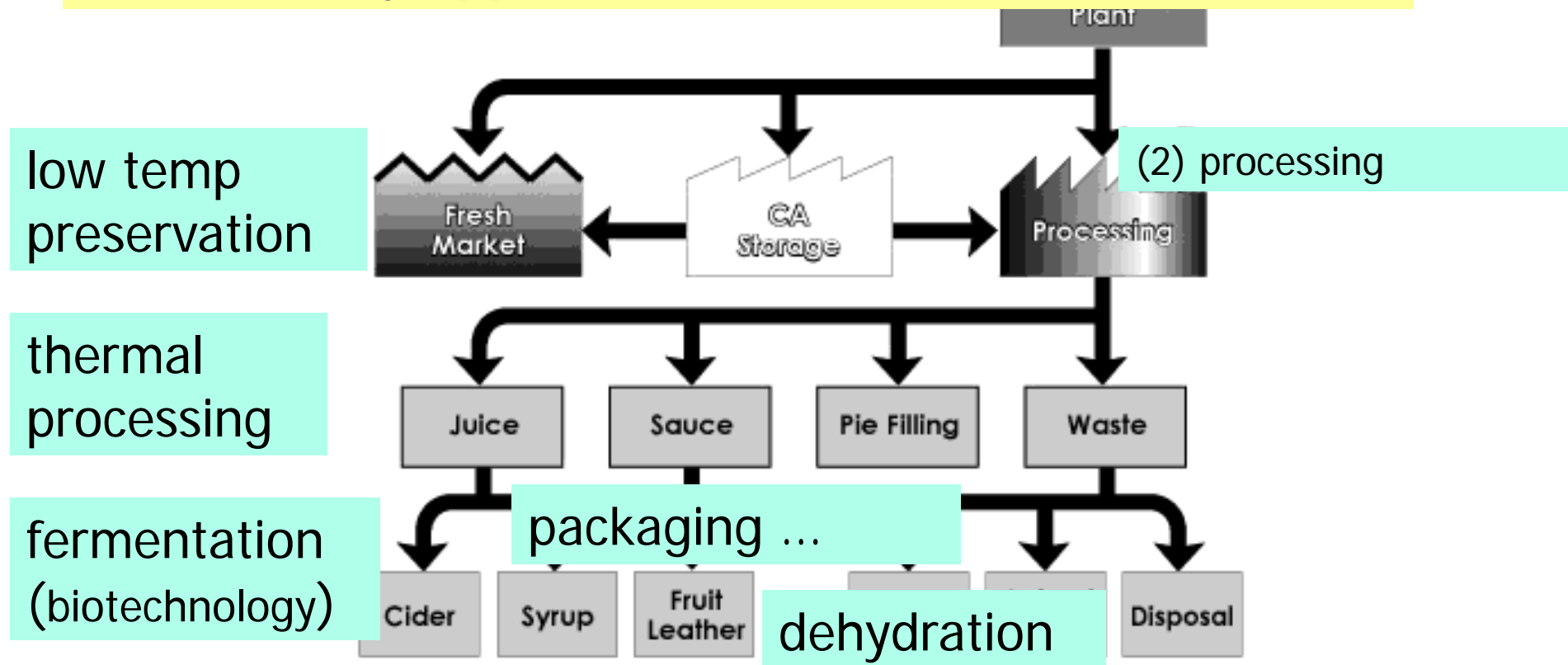
Atmospheric gasses:

21% O₂ 0.03% CO₂ 78% N₂





... Processing of Apples ...
 by application of Food Science



... Processing of Apples into:

Juice

- usually pasteurized *or*
- Commercially Sterilized (in “*tetrapak*” boxes)
- starting material for production of **cider** (by yeast)
- and/or apple **vinegar** (by bacteria)



... Processing of Apples into:

- Juice

apple juice $\xrightarrow{\text{Yeast}}$ ETOH + flavours
"APPLE CIDER"

Bacteria \searrow Acetic acid
"APPLE VINEGAR"



... Processing of Apples into:

- Apple Sauce, Pie Fillings
- Dehydrated Apple
 - Slices, Fruit Leather,
 - Ingredient for confectionary products,
 - breakfast cereals etc.





Fruit Leather time



... Processing of Apples into:

- “Fruit to go”
 - “100% Dried Fruit Snack”
 - IMPORTANT: Look at
 - Label- Information
 - Type of packaging





Critical Thinking

Identify a food that you enjoy.

How do you think a
foodscientist/technologist
would be involved in the production,
processing and marketing of that food
product?



Questions?



Trends in Food Consumption in Canada



Trends in Food Consumption in Canada

Review data from Statistics Canada (2009)

<http://www.statcan.gc.ca/pub/21-020-x/2009001/aftertoc-aprestdm1-eng.htm>

Canadians are:

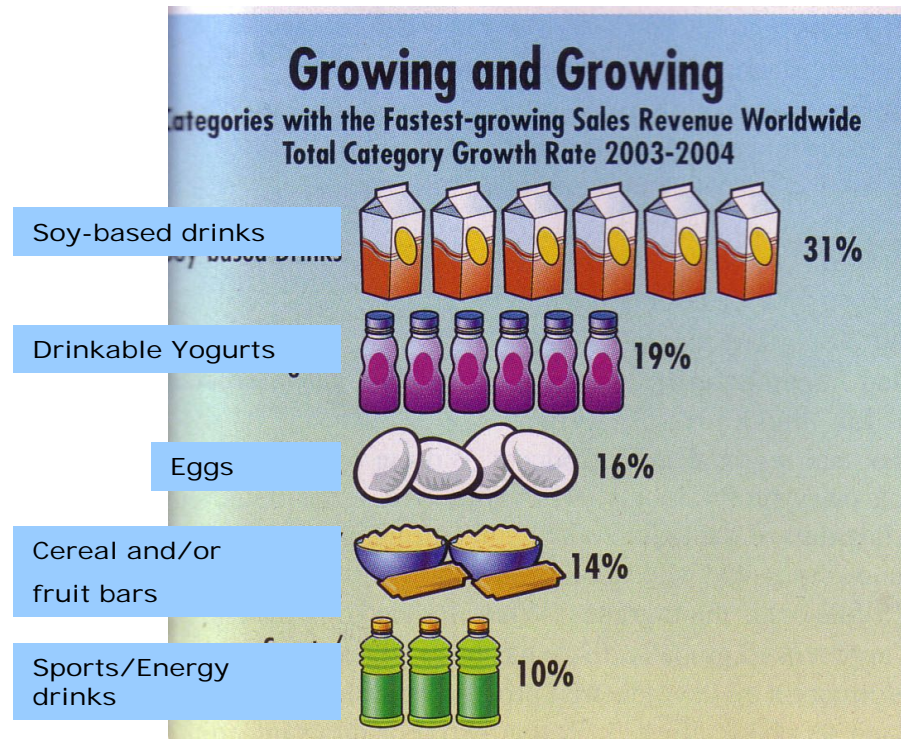
- On a per capita basis, the Canadian diet in 2009 included more fresh fruit and vegetables, cereals, coffee and fish compared with 2008.
- Processed fruit in the diet fell by 2.4% in 2009.
- Per capita red meat available for consumption continued its decline in 2009.
- Total oil and fat consumption continued to decline
- Decreasing total daily intake of calories per person

Consumption Trends – Increase? Decrease? Predicted (2001-3 to 2020) for sub-categories

<http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1170944121865&lang=eng>

- **Meat** - beef, pork, lamb, fish poultry
- **Fruit** - fresh, frozen, dried, canned, juice
- **Vegetables** - fresh, frozen, canned, juice
- **Dairy** - milk, cheese, ice cream, cream
- **Beverages** – soft drinks, alcoholic beverages, coffee, tea

Categories with the fastest-growing sales revenue Worldwide (2004)



Source: ACNielsen in *Prepared Foods*,
March 2005

Consumption Trends

<http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1170944121865&lang=eng>

http://www4.agr.gc.ca/resources/prod/doc/agr/pdf/ft-ta_e.pdf

Increasing

- poultry
- fish
- 1%, skim milk
- cheese, yogurt
- vegetable oil
- cereals, rice, whole grains
- fruit
- vegetables
- coffee
- soft drinks
- wine
- tea

Decreasing

- beef (since '75),
- full fat, canned evaporated & powdered milks
- animal fat
- refined sugar
- canned fruit
- vegetable juice
- beer, distilled spirits (since mid '70s)

Why?



Trends in Food Consumption – predict that consumers will ...

- Demand higher quality products
- Concerned about health, nutrition, food safety, environmental impact (eg packaging)
- Eat more fruits and vegetables
- Prepare and eat more ethnic dishes
- Continue to consume lower fat (vs full fat) milk products
- Want more variety
- Eat out more often and “on the run”
- Buy more prepared/convenience, take-home foods







Your homework

- Next time you are in grocery store observe:
 - Variety
 - Shelf size
 - Label



Why ?

- Read Lesson 1
- Think of the reasons for trends in consumption of particular commodities:
 - general trends
 - specific product-related causes



? What is in the future for:

- Poultry
- Meat
- Fish



Do we have the same Consumption patterns as or American neighbors?

- Are Obesity problems the same in Canada and the U.S.?
- What about the rest of the world?
 - Is food availability the same all over the world?
 - Is food distribution the same?



Questions?



Terms to remember

- Food Science
- Food Technology
- Pioneers in Food Science and Technology
- Highlights of Canadian Food Systems
- Apple processing and storage
- Food consumption highlights in Canada