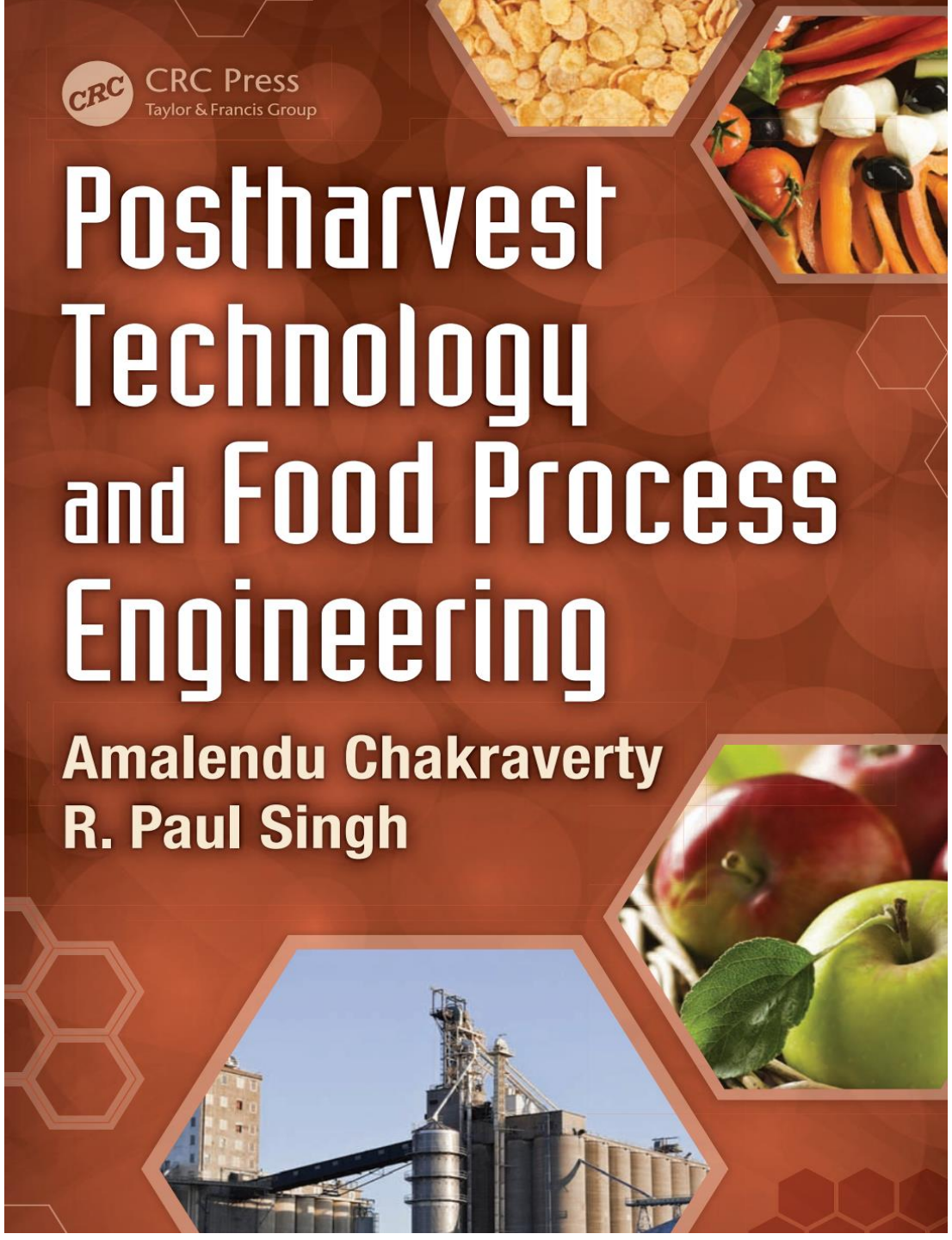
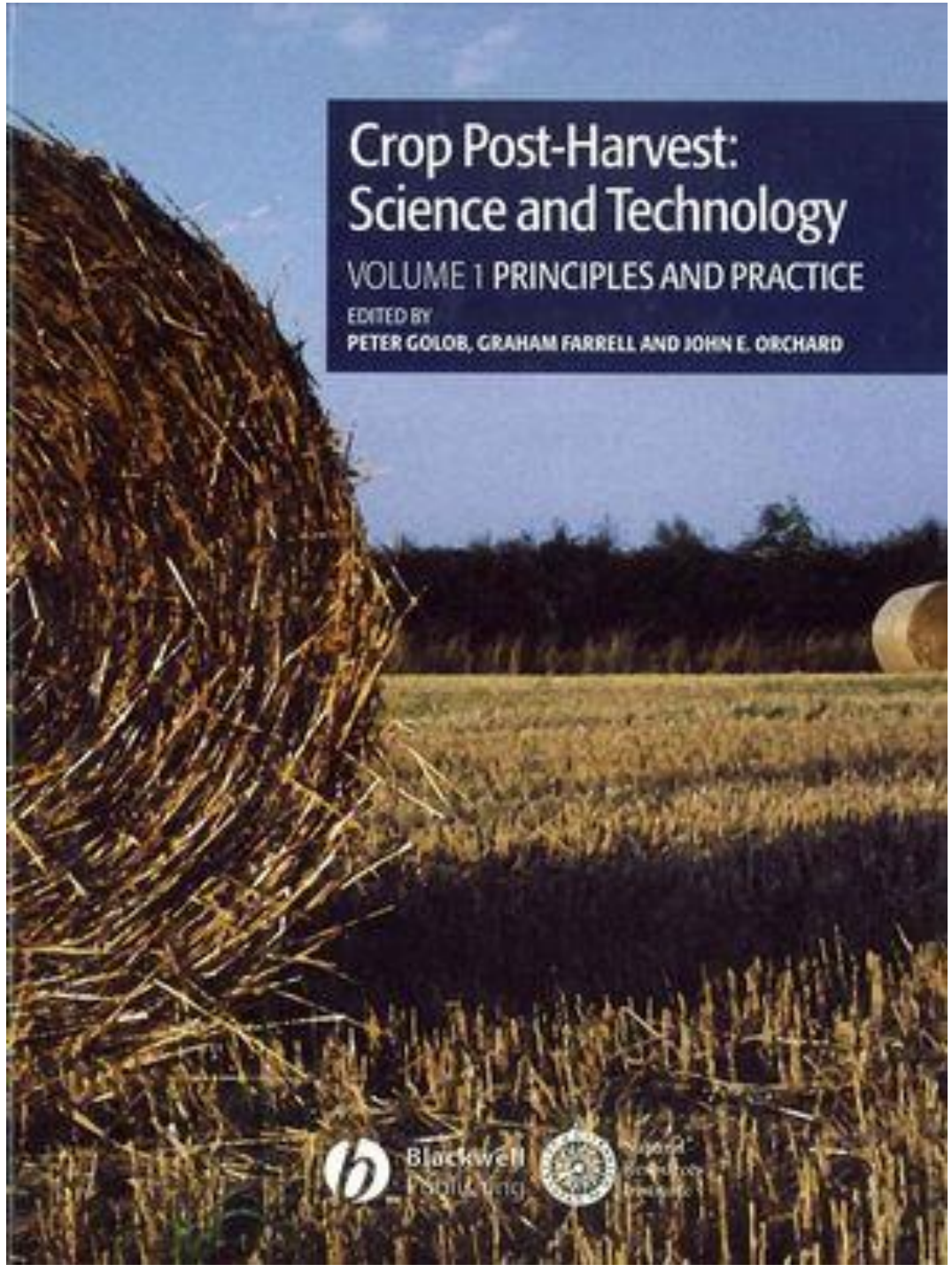
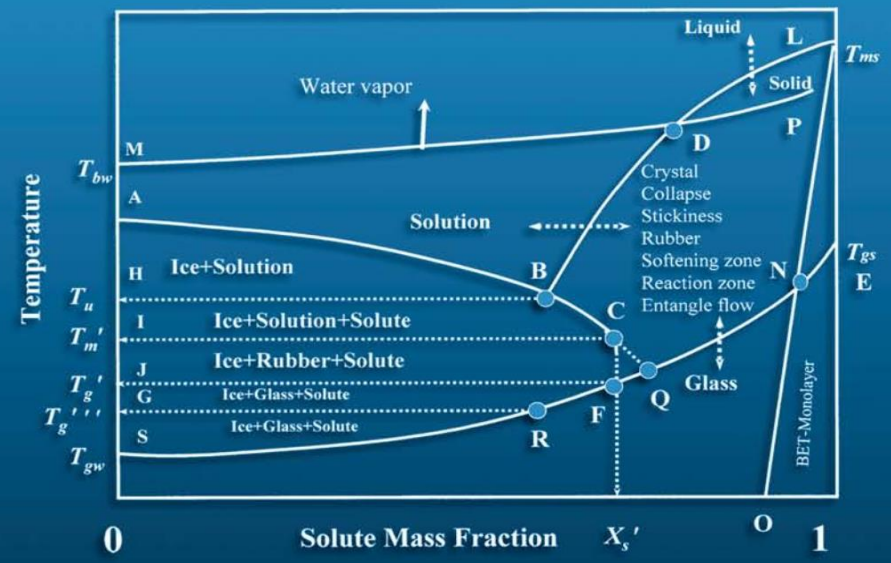

CRC Press
Taylor & Francis Group
Postharvest Technology and Food Process Engineering
Amalendu Chakraverty
R. Paul Singh


Crop Post-Harvest: Science and Technology
VOLUME 1 PRINCIPLES AND PRACTICE
EDITED BY
PETER GOLOB, GRAHAM FARRELL AND JOHN E. ORCHARD
Blackwell

Handbook of Food Preservation

Second Edition

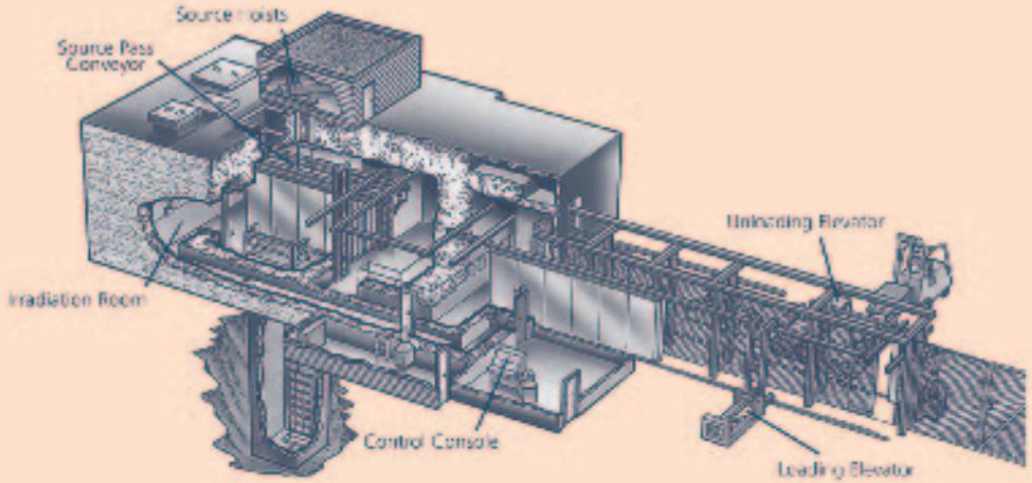


edited by

M. Shafiur Rahman

Handbook of Postharvest Technology

Cereals, Fruits, Vegetables, Tea, and Spices



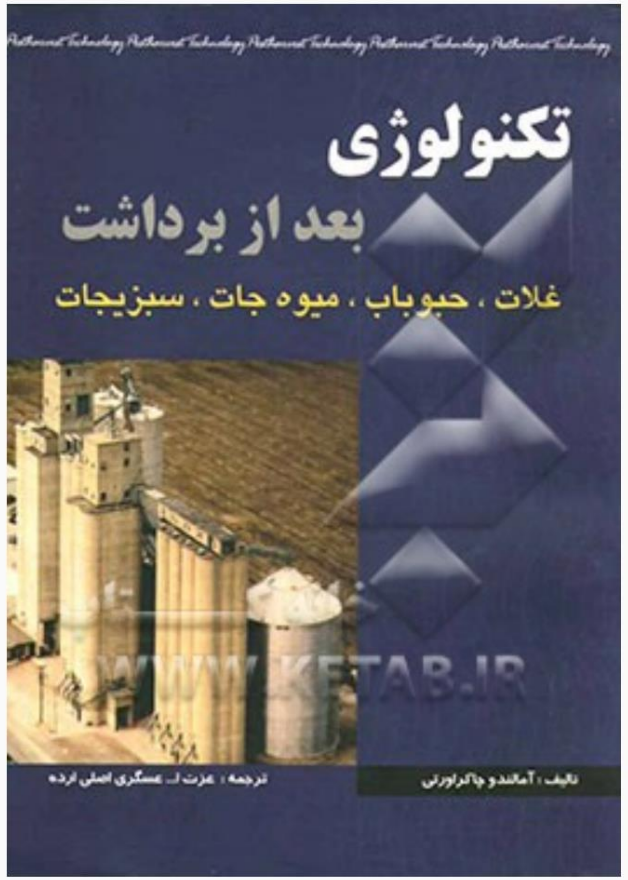
edited by

Amalendu Chakraverty

Arun S. Mujumdar

G. S. Vijaya Raghavan

Hosahalli S. Ramaswamy



پدیدآورندگان : مترجم: عزت‌الله عسکری‌اصلی‌ارده

موضوع : میوه‌ها - تکنولوژی پس از برداشت

ناشر : یاوریان

محل نشر : تهران

قطع : وزیری

نوع کتاب : ترجمه

زبان اصلی : انگلیسی

قیمت : 38000

نوع جلد : شومیز

قطع : وزیری

تیراژ : 2200

تعداد صفحات : 464

تاریخ نشر : 1384/12/28

رده دیویی : 063015

شابک : 964-95871-5-2

, "در کتاب حاضر، موضوعاتی از این دست بیان گردیده است: فنون خشک کردن محصولات کشاورزی، معرفی انواع خشک‌کن‌های دانه، تکنولوژی ذخیره و نگهداری محصولات کشاورزی، فرآیند نیم‌پز کردن و مشروطسازی دانه، تکنولوژی تبدیل دانه‌ی غلات و حبوبات شامل روش‌های مختلف پوست‌گیری، سفیدکنی و آسیاب‌کنی، تکنولوژی استفاده از محصولات فرعی تبدیل از قبیل سبوس برنج و بیوماس، و مدیریت پس از برداشت میوه‌جات و سبزیجات نظیر خنک‌سازی، بسته‌بندی، و نگهداری."

Post-harvest (Technology / Processing / Handling)

- Cereals, pulses, fruits, and vegetables are the important food crops in the world as these are the bulk sources of calories, proteins, and nutrients
- The supply an adequate quantity of grains and other food to the expanding world population is a challenge to mankind
- The supply of grains and other food crops can be augmented by increasing production as well as by reducing postharvest losses

- **Definition:** All activities that occur after production of agricultural commodities, including transportation, cooling, cleaning, sorting, storage, packaging, processing and marketing of agricultural products from the farmgate to the distributors, either for domestic consumption or export
- After the **on-farm** *post-harvest* operations the products find ready markets to consumers and/or the *agro-processing* industry

Agro-processing Industry (Agroindustry)

- Agro-processing activities comprise two major categories: **Primary** and **Secondary** operations.

- ***Primary processing*** *operations* involve activities such as crop shelling/threshing, drying, cleaning, grading, storage, packaging etc.
- These activities are mainly carried out at the farm and only transform the commodity into a slightly different form prior to marketing or further processing

- ***Secondary processing*** *operations* involve increasing **nutritional** or **market value** of the commodity. The physical form or appearance of the commodity is often totally changed from the original.

- Some **examples of secondary processing** are **milling** grain into flour, **grinding** groundnuts into peanut butter, **pressing oil** out of oil seeds, pressing **juice** out of fruit, making **cheese** out of milk and manufacturing of mince meat.

- Depending on the type of commodity, equipment needed for **primary processing** is completely different from that used in **secondary processing** or major adjustments/modifications need to be done to suit either.

The Importance of Post-harvest Technology

➢ In poorer countries

- Provide the **first step** for the development of manufacturing
- Processed products can generate **export earnings**❶
- Can help to ensure a **safe and sufficient food supply** in growing cities
- Can contribute toward **environmental sustainability** by minimizing unnecessary production, thereby saving on scarce **land and water resources**, and by providing alternatives to the heavy application of **chemical inputs** with potentially harmful side-effects
- Can engender **rural development**
- Can utilise **surplus labour**, thereby slowing rural–urban **migration**
- Postharvest development in rural areas can result in **increased demand** for agricultural raw materials for processing

❑ In richer countries

- Ensuring food safety and quality
- Significant source of employment
- In the context of **globalisation**, companies in developed countries are becoming enmeshed with those in developing countries

The overall potential of agro-processing

- **Increase the value of crops of poor farmers and thus yield higher returns**
- **Expand marketing opportunities**
- **Improve livelihoods of people**
- **Extend shelf-life of commodities**
- **Overcome seasonality and perishability limitations**
- **Contribution to GDP, exports and employment**
- **Contribution to food security**

  Improved storage technologies such as **biological pest control** or **controlled atmosphere** storage reduce post-harvest **losses**, thereby increasing the amount of **food available for consumption**❶

- **Contribution to living standards**

Storage Life of Some Fresh Foods at Normal Atmospheric Conditions

Food	Terminology	Storage Life
Meat, fish, and milk	Perishable	1–2 days
Fruits and vegetables	Semiperishable	1–2 weeks
Root crops	Semiperishable	3–4 weeks
Grains, pulses, seeds, and nuts	Nonperishable (Durable)	12 Months

Differences between durable and perishable commodities

Durables	Perishables
Designed for preservation	Not designed for preservation
Low moisture content, usually 10–15%	High moisture content, usually 50–90%
Small unit size, less than 1 g	Large unit size, typically 5 g to 6 kg
Often symmetrical in shape	Often asymmetrical in shape
Hard texture	Soft texture
Stable – inherent storage life of years	Perishable – natural storage life of a few days to months depending on type
Losses mainly caused by external factors, e.g. mould, insects and rodents	Losses caused by external factors, mainly moulds and bacteria, and internal factors, e.g. respiration, sprouting, ripening, etc.

Losses and Causes

- **Hunger** and **malnutrition** can exist in spite of adequate food production
- These can be the result of uneven distribution, **losses**, and deterioration of available food resources
- Hence, maximum utilization of available food and minimization of postharvest food **losses** are absolutely essential
- Losses vary by crop variety, year, pest, storage period, methods of threshing, drying, handling, storage, processing, transportation, and distribution according to both the climate and the culture in which the food is produced and consumed
- With such an enormous **variability**, it is not surprising that **reliable statistics** of postharvest food losses are not available
- It is also very difficult to determine the exact **magnitude of losses**

- Fortunately, **research and development** and **education** activities related to postharvest technology of crops have been growing

- For each postharvest operation there is a **possibility of some losses** either in quantity or in quality of crop product

- For **cereals**, the overall **postharvest losses** are usually estimated to be in the range of **5–20%**

- For **fruits and vegetables** it may vary from **20% to 50%**

- If these losses can be minimized, many countries of the world may become **self-sufficient** in food

- Mechanical, physical, chemical, and microbial effects are the leading **causes** of food deterioration and spoilage *(Table 15)*

- Damage can start at the initial point by mishandling of foods during **harvesting**, **post-harvest**, **processing**, and **distribution**; this may lead to ultimate reduction of **shelf life**

- ✓ After storage for a certain period, one or more **quality attributes** of a food may reach an undesirable state. At that time, the food is considered unsuitable for consumption and is said to have reached the end of its **shelf life**

- ✓ **Best-before date** is set shorter than the shelf life with a good margin

- ✓ Hence, it is usually safe and palatable to consume a product a long time after the **best-before date**, provided the product has been stored at the recommended conditions (It may just lose its freshness, taste, aroma or nutrients)

- ✓ Products may be marketed with the production date "**pack date**" and "**best-before date**." Alternative markings are **use-by date** or **expiration date**, which may be **closer to shelf life** than best-before

- ✓ The product quality can be defined using many factors, including appearance, yield, eating characteristics, and microbial characteristics, but ultimately the final use must provide a pleasurable experience for the consumer

- ✓ The ***best-before date*** gives you an idea of how long the food will last *before* it loses quality

- ✓ "**Best before**" dates are about quality, not safety - When the date is passed, it doesn't mean that the food will be harmful, but it might begin to lose its flavour and texture

- ✓ **Expiration dates** tell consumers the last day a product is safe to consume

- **Quality loss** can be minimized at any stage and thus quality depends on the **overall control of the processing chain.**

Some examples of deterioration:

(i) **Bruising** of fruits and vegetables during harvesting and postharvest handing, leading to the development of **rot**

(ii) **Tuberous and leafy vegetables** lose water when kept in atmospheres with low humidity and, subsequently, **wilt**

(iii) **Dried foods** kept in high humidity may pick up moisture and become **soggy (wet)**

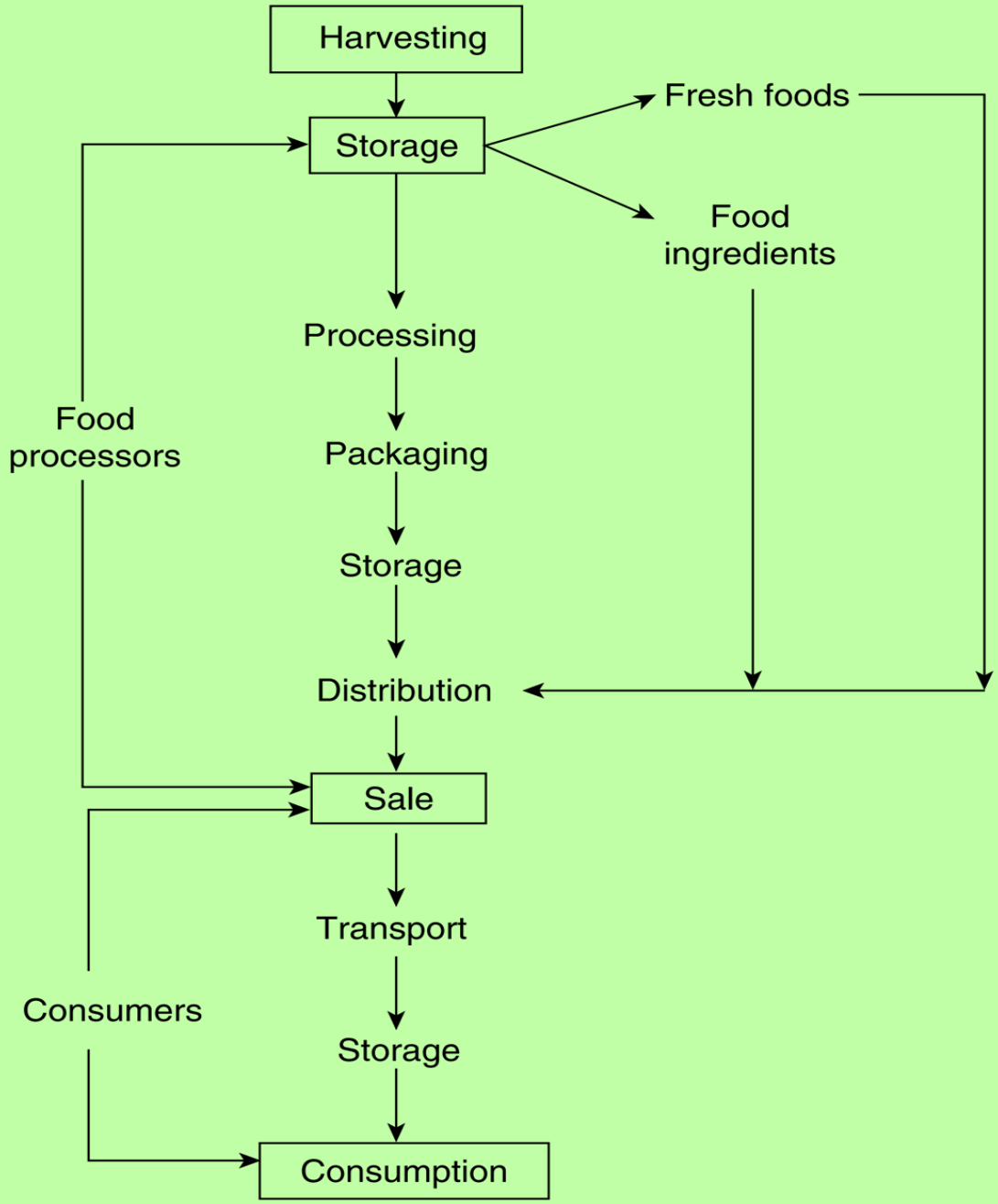


FIGURE 1.1 Various stages of food production, manufacture, storage, distribution, and sale.

Major Quality-Loss Mechanisms

Microbiological	Enzymatic	Chemical	Physical	Mechanical
Microorganism growth	Browning	Color loss	Collapse	Bruising due to vibration
Off-flavor	Color change	Flavor loss	Controlled release	Cracking
Toxin production	Off-flavor	Nonenzymatic browning	Crystallization	Damage due to pressure
		Nutrient loss	Flavor encapsulation	
		Oxidation–reduction	Phase changes	
		Rancidity	Recrystallization	
			Shrinkage	
			Transport of component	

- The **four sources** of microbial contaminants are **soil**, **water**, **air**, and **animals** (insects, rodents, and humans)

Organisms That Spoil Foods

1. Microorganisms
    a. Fungi: mold and yeast
    b. Bacteria
    c. Phages
    d. Protozoa
2. Insects and mites
    a. Directly by eating (infestation)
    b. Indirectly by spreading diseases (fruitfly, housefly)
3. Rodents
    a. Directly by consuming food
    b. Indirectly by spreading diseases