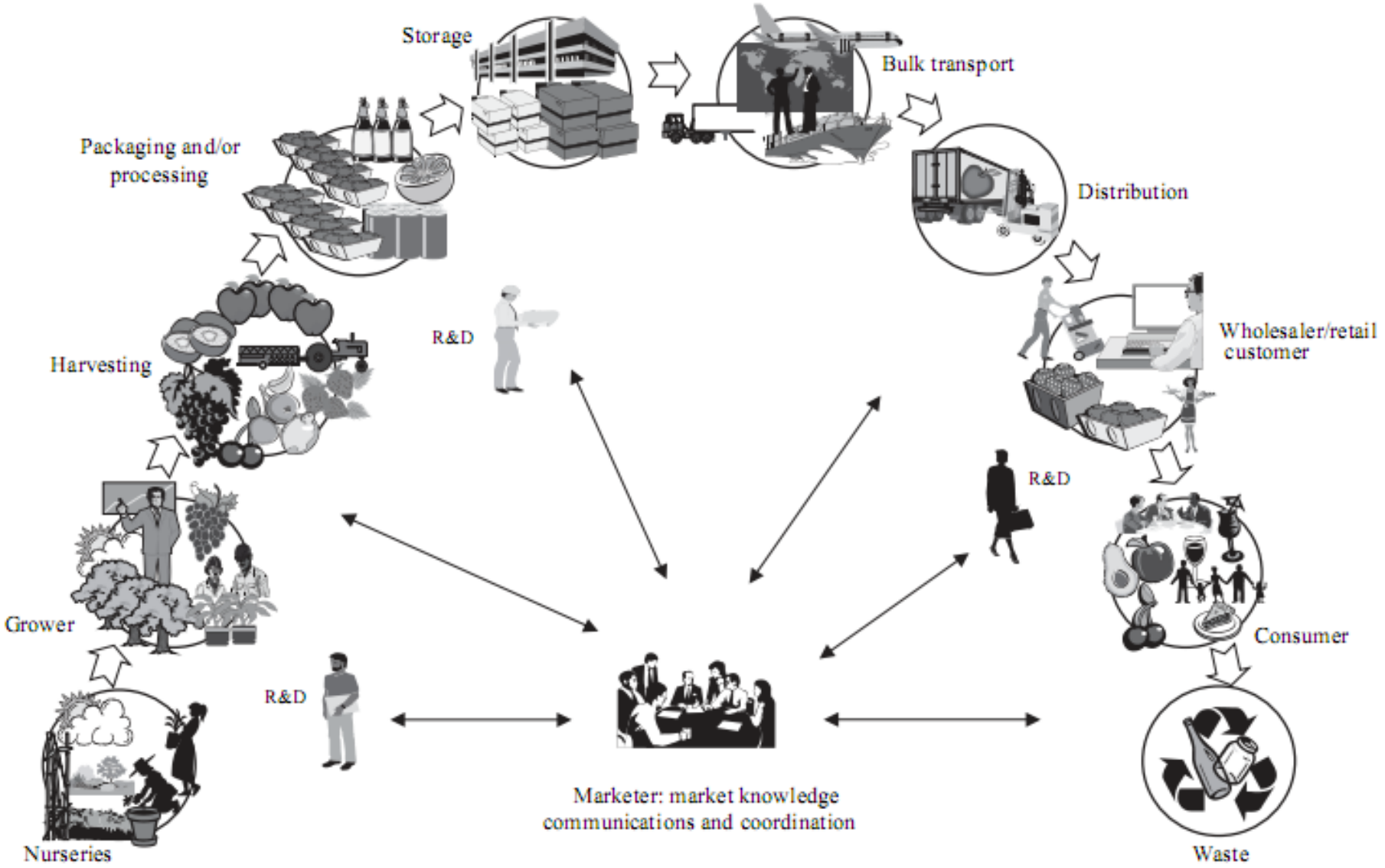
فناوری پس از برداشت ۱

Orchard to market value chain



Source: Kerr et al. (1998)

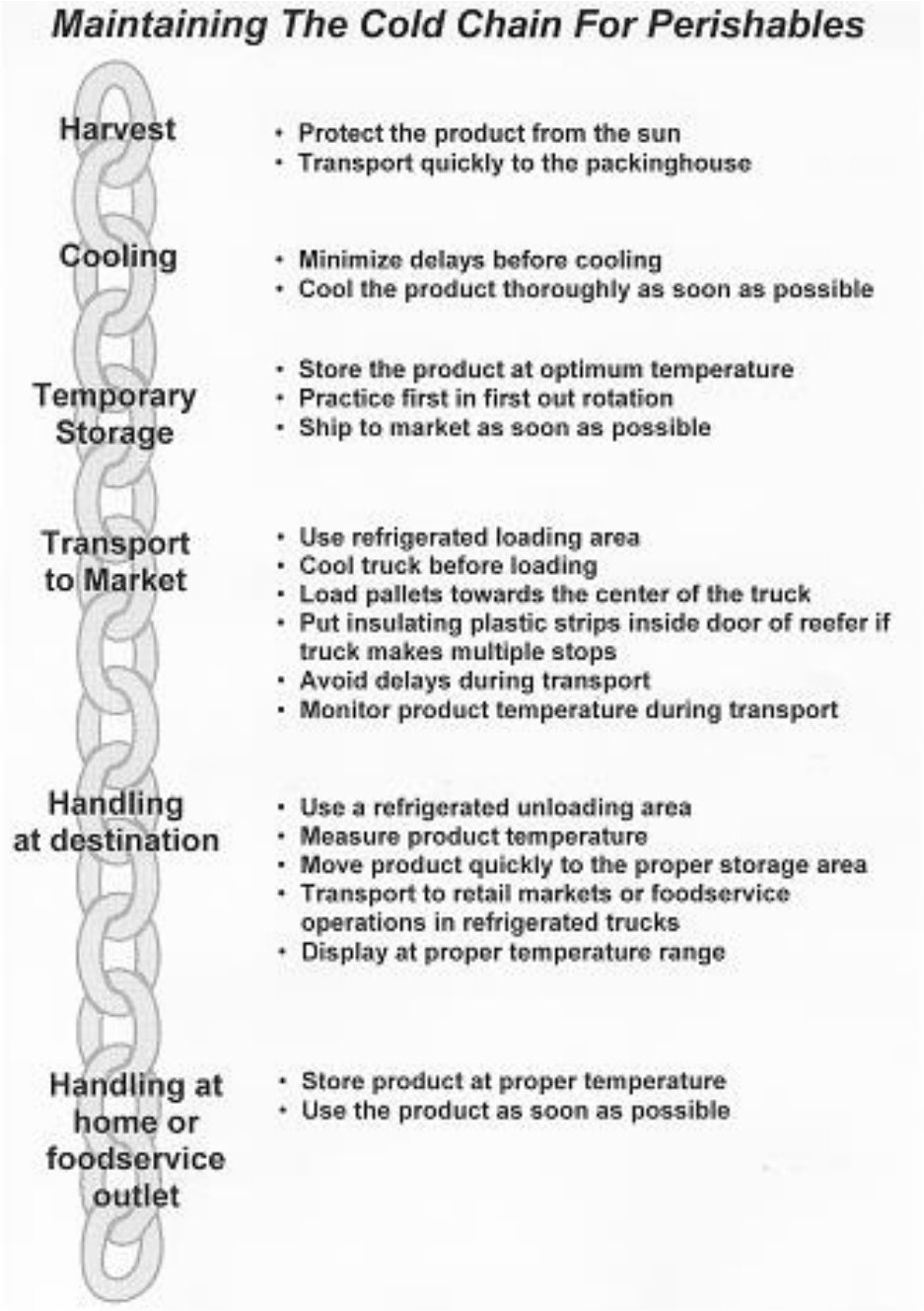


Fig. 2. Actions needed to maintain the cold chain throughout the postharvest handling system for perishable horticultural crops.

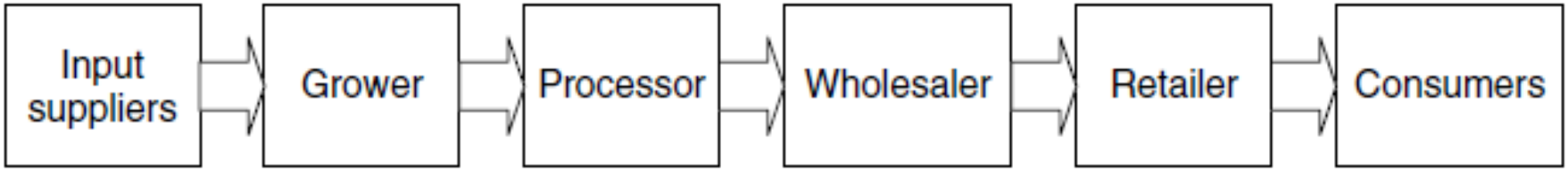
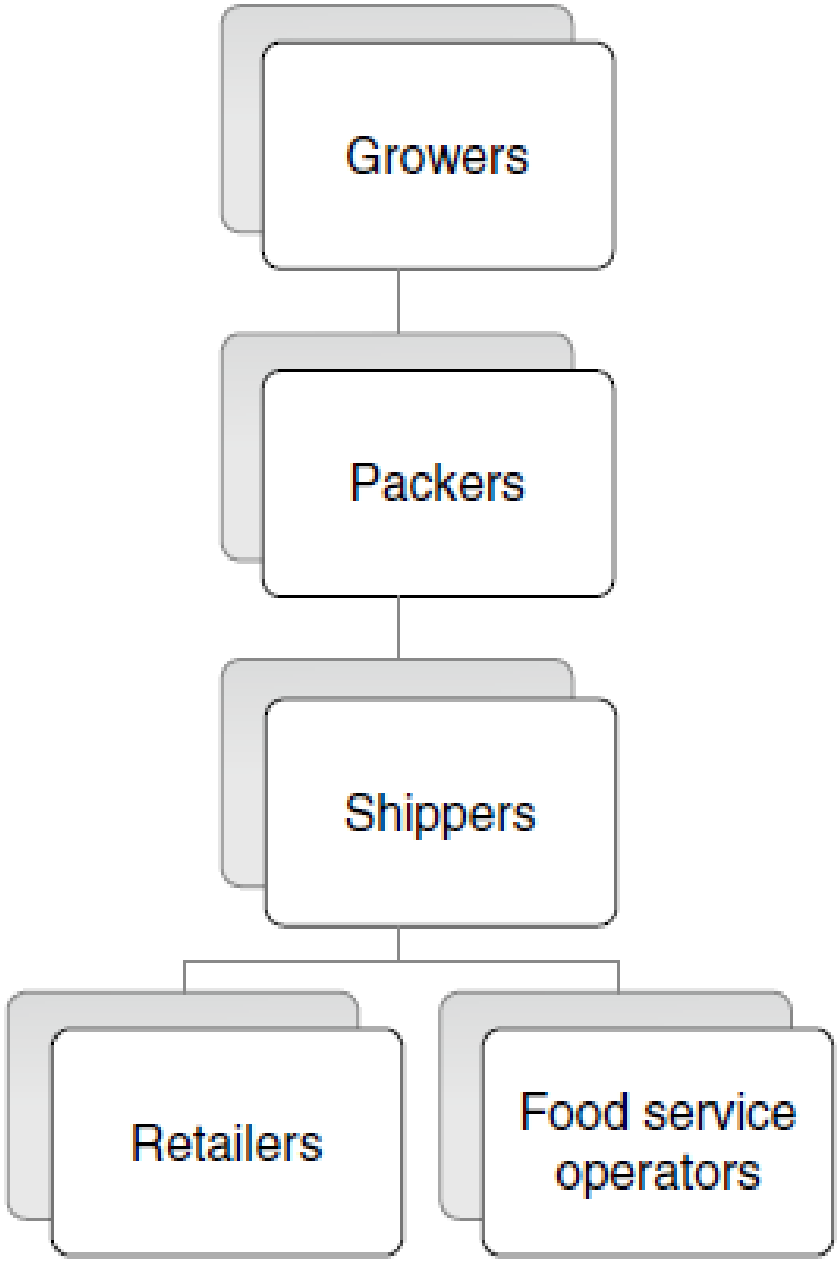


Figure 6.1 Simplified supply chain showing flow of product from input suppliers to consumers.



Basic structure of the produce industry. Adapted from: Prevor

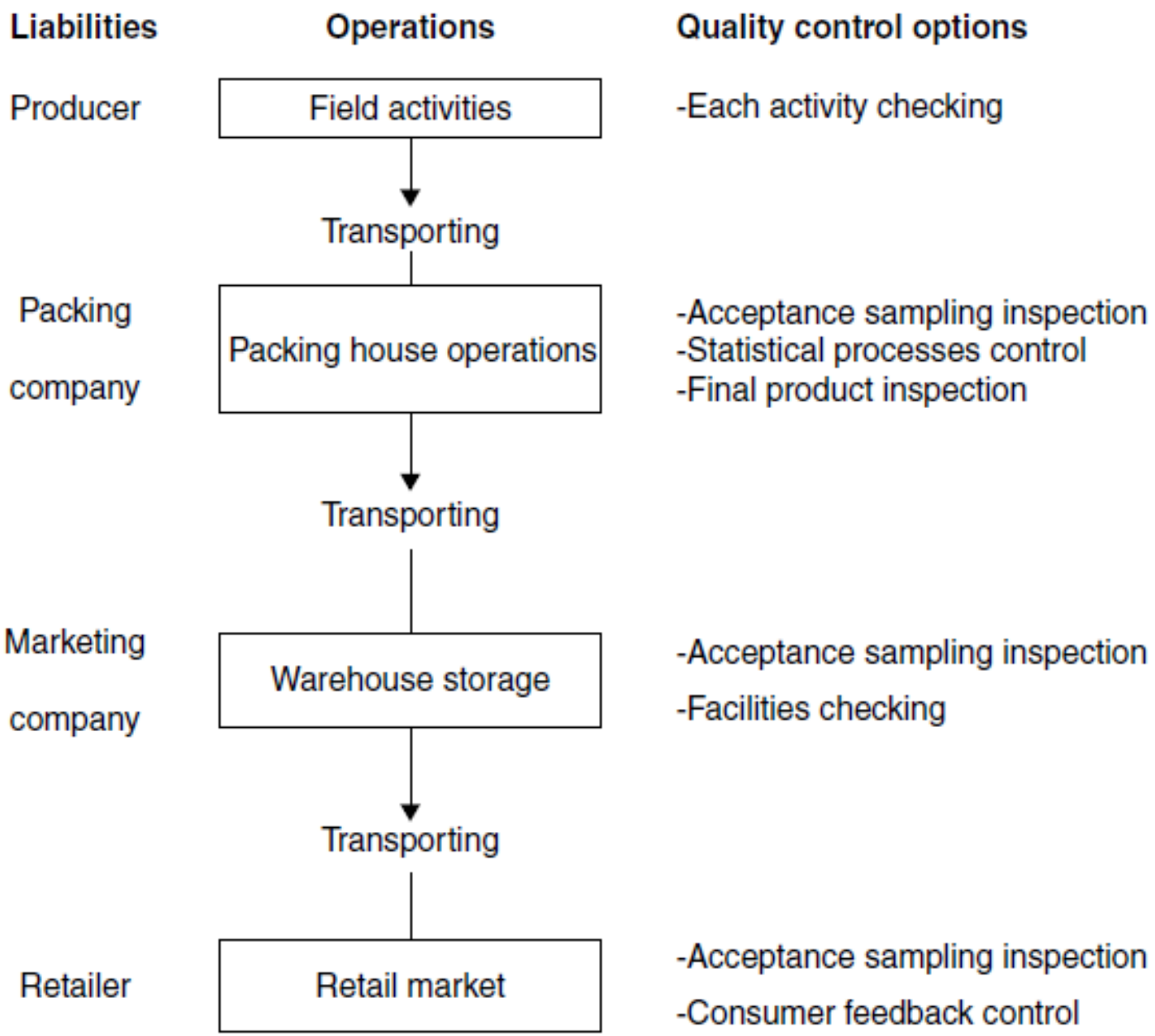


Figure 8.5 Typical flow chart for fresh produce with selected sampling and process control points. Source: Lidror and Prussia (1993).

Table 8.2 Quality assurance procedures during handling of horticultural perishables (Kader, 2001)

Handling steps	Quality assurance procedures
Harvesting	Training workers on proper maturity and quality selection
Packing house operations	Checking product maturity, quality, and temperature upon arrival Implementing an effective sanitation program to reduce microbial load Checking packaging materials and shipping containers to ensure they meet specifications Training workers on proper grading by quality (defects, color, size), packing and other packing house operations Inspecting a random sample of the packed product to ensure that it meets grade specification Monitoring product temperature to assure completion of the cooling process Maintaining effective communications with quality inspectors and receivers to correct any deficiencies as soon as they are identified
Transportation	Inspecting all transport vehicles before loading for functionality and cleanliness Training workers on proper loading and placement of temperature recording devices in each load Keeping records of all shipments as part of the "traceback" system
Handling at destination	Checking product quality upon receipt and moving it quickly to the appropriate storage area Shipping product from distribution center to retail markets without delay and on a first in/first out basis unless its condition necessitates a different order

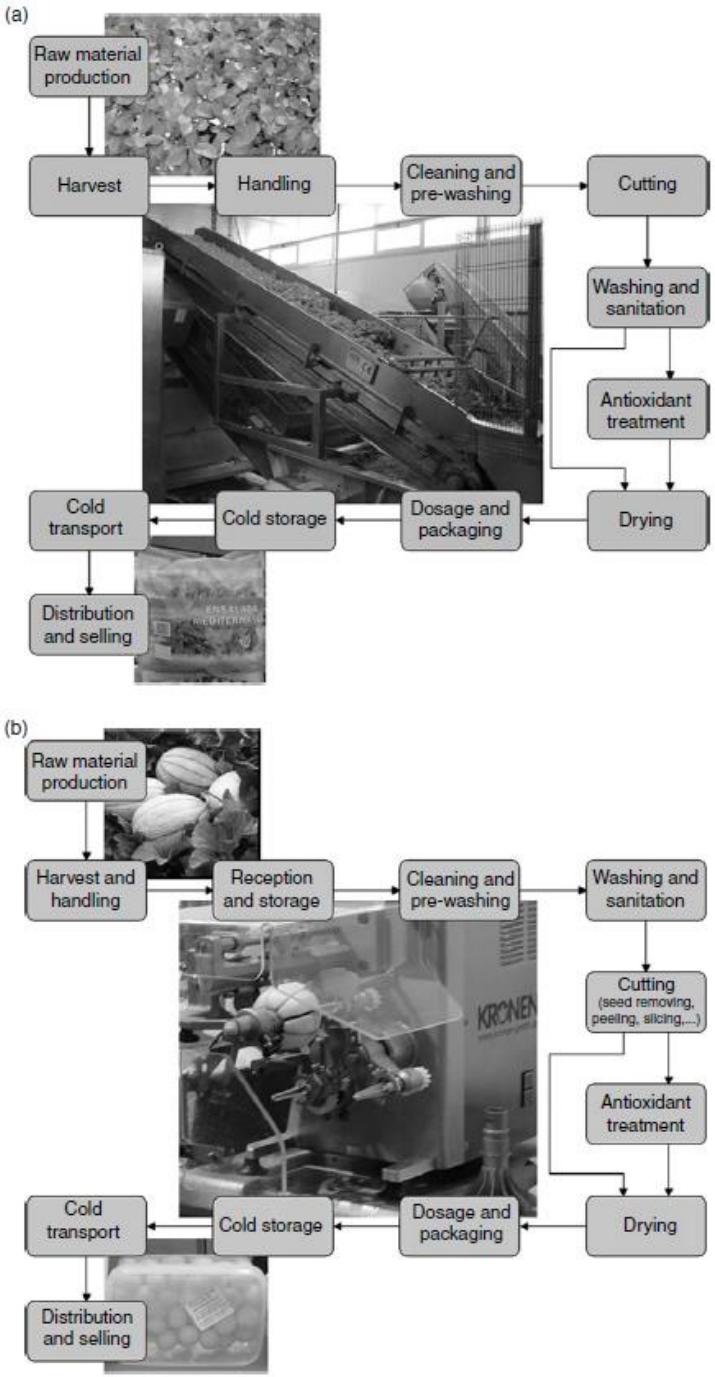


Figure 10.5 General diagram flows of processing operations for leafy vegetables (a) and fruit (b).

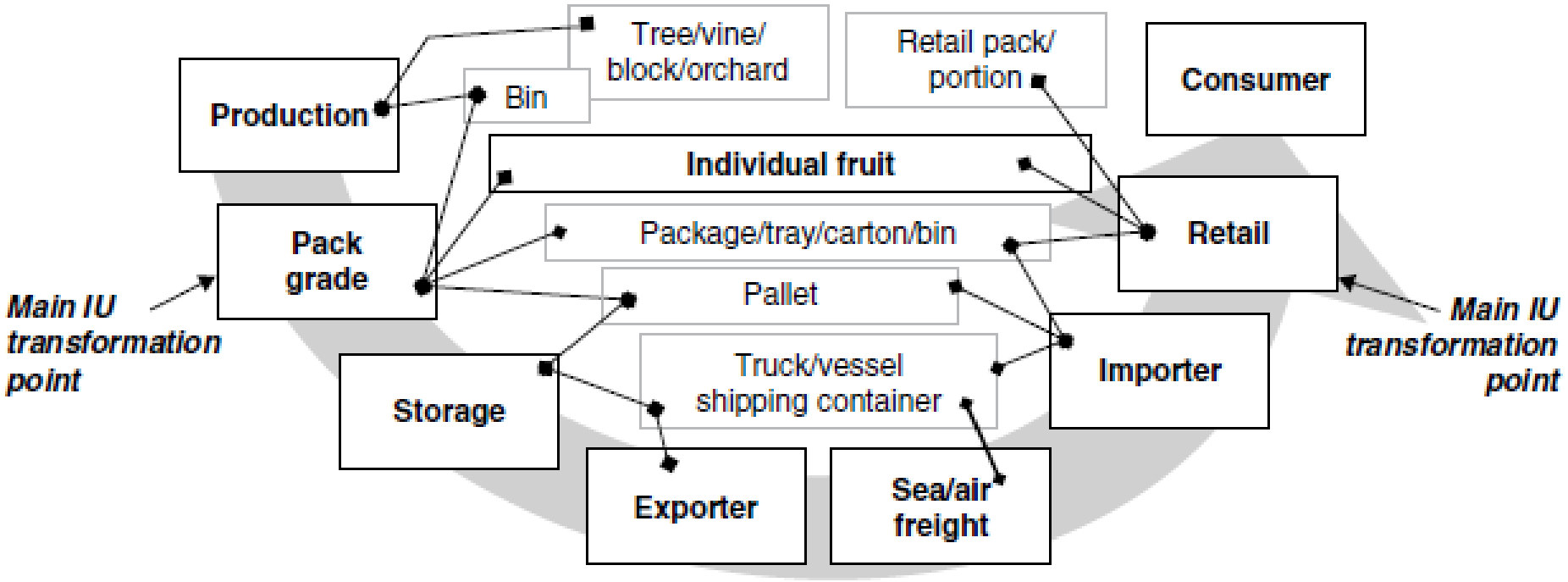
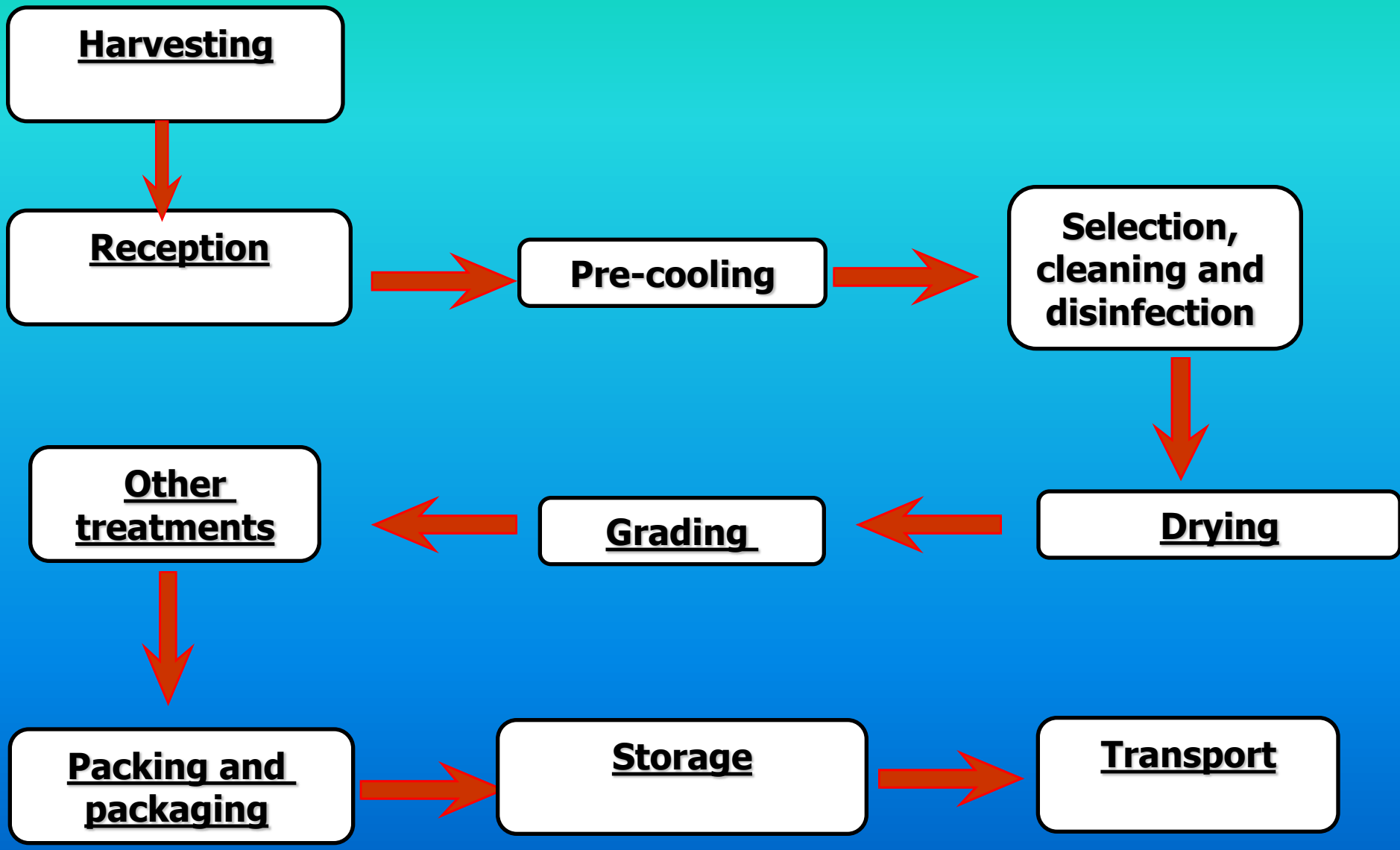


Figure 12.1 Typical identifiable units (IUs) in a postharvest system. Source: Bollen et al. (2007).

فیزیولوژی و تکنولوژی پس از برداشت

- فیزیولوژی پس از برداشت
- تکنولوژی پس از برداشت

Post-harvest procedures



Handling and preservation of fruits and vegetables

1-_Harvest handling

1-1- Maturity index for fruits and vegetables

1-2-Harvesting containers

1-3-Tools for harvesting

1-4-Packing in the field and transport to packinghouse

2- Post-harvest handling

2-1- Curing of roots, tubers, and bulb crops

2-2- Operations prior to packaging

2-3- Packaging

2-4- Cooling methods and temperatures

2-5- Storage

2-7- Pest control and decay

Industrial methods of food preservation include:

- Removal of moisture—drying/dehydration, concentration, etc.
- Removal of heat—refrigeration/cold-storage, freezing, etc.
- Addition of heat—canning, pasteurization, etc.
- Addition of chemicals/preservatives
- Fermentation
- Other methods—application of high-frequency current, irradiation, etc.

LOSSES

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

whereas for fruits and vegetables it may vary from 20% to 50%.

Harvesting at the correct maturity is

key to satisfying quality expectations.

Maturity Indices = Harvest Indices

Importance of Maturity Indices

Sensory and Nutritional Quality

Use—Fresh market or Processed

Adequate shelf-life

Facilitate marketing—standards

Productivity

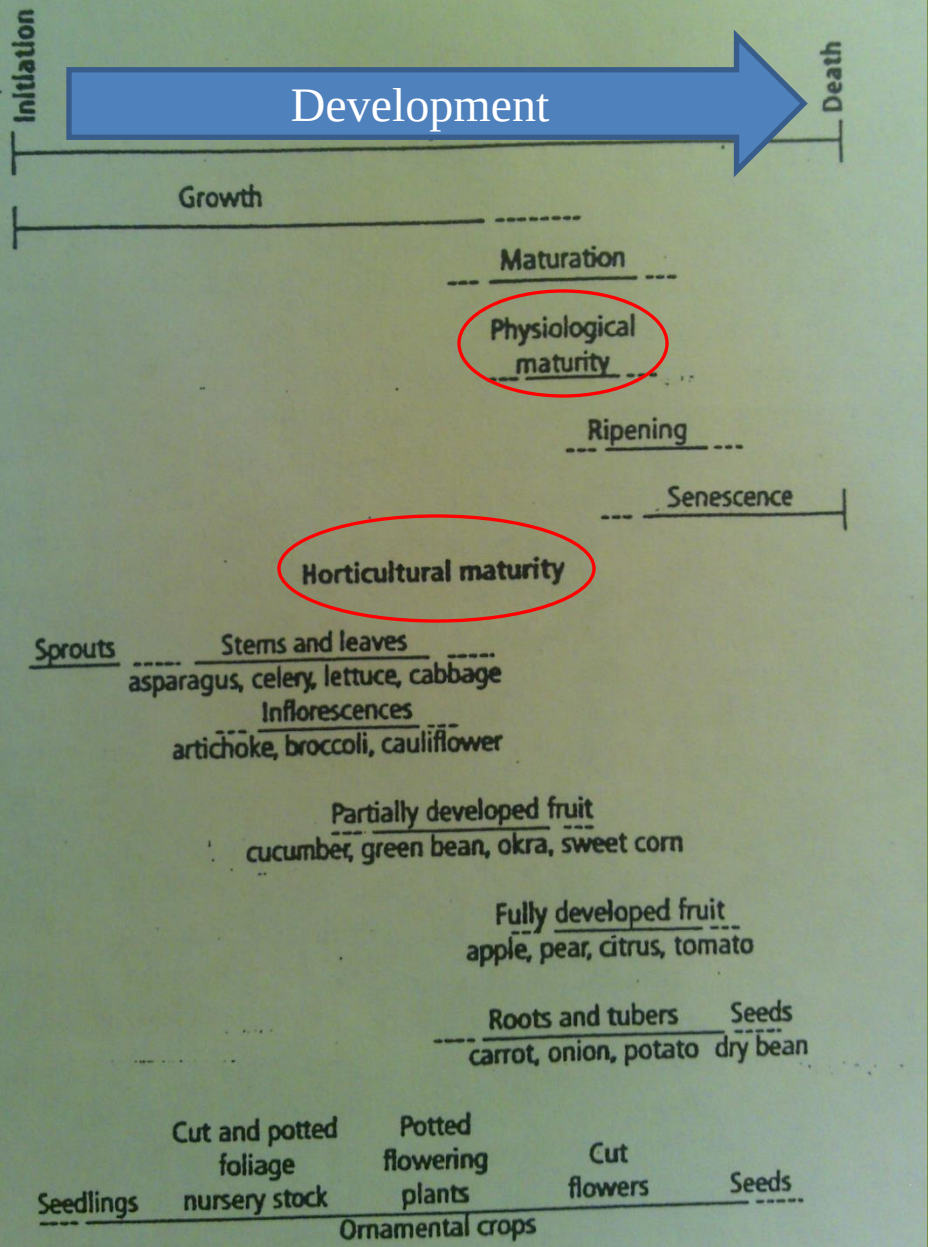
Early stage of development

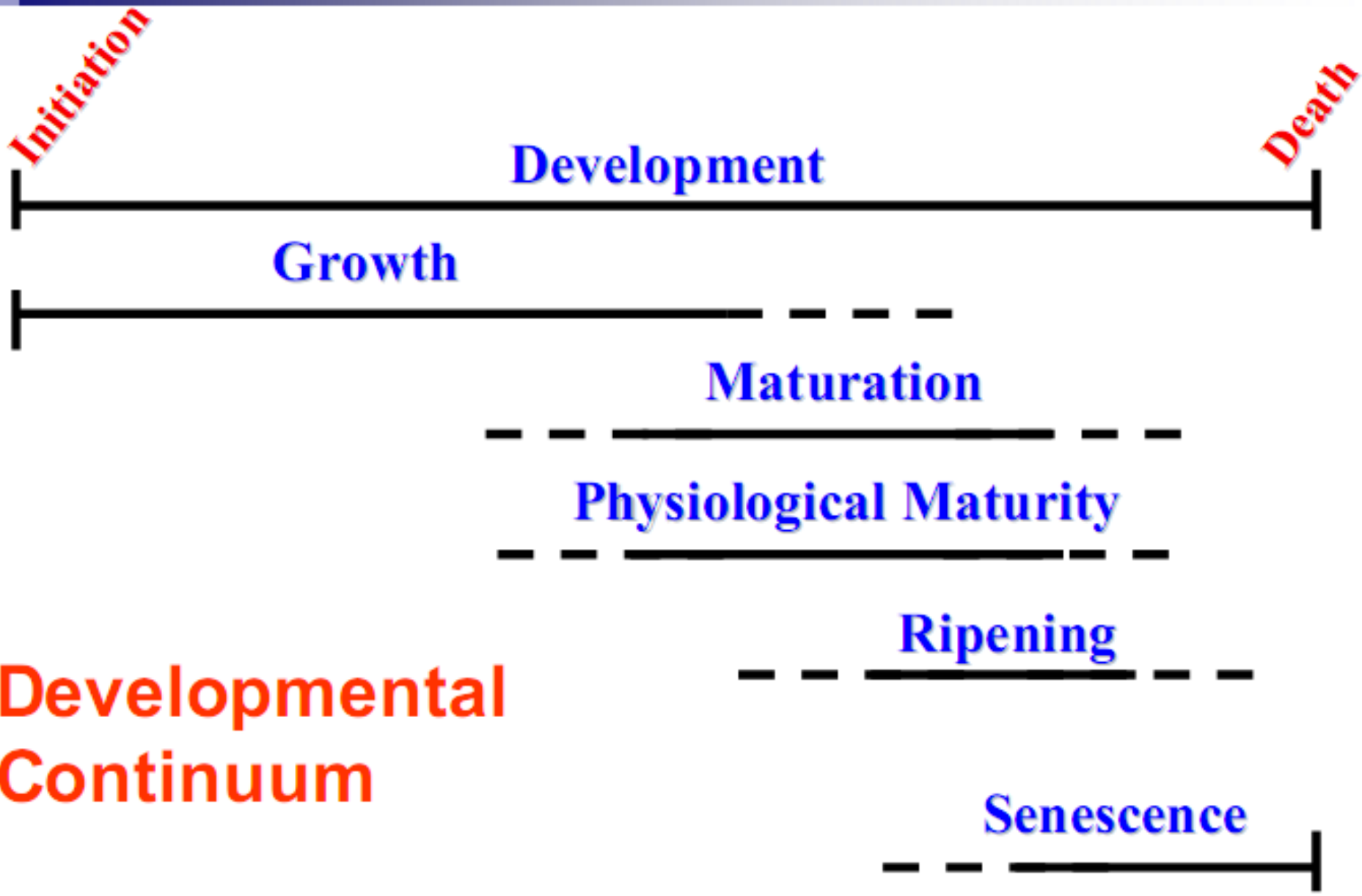
Mid stage of development

Late stage of development

Figure 6.1

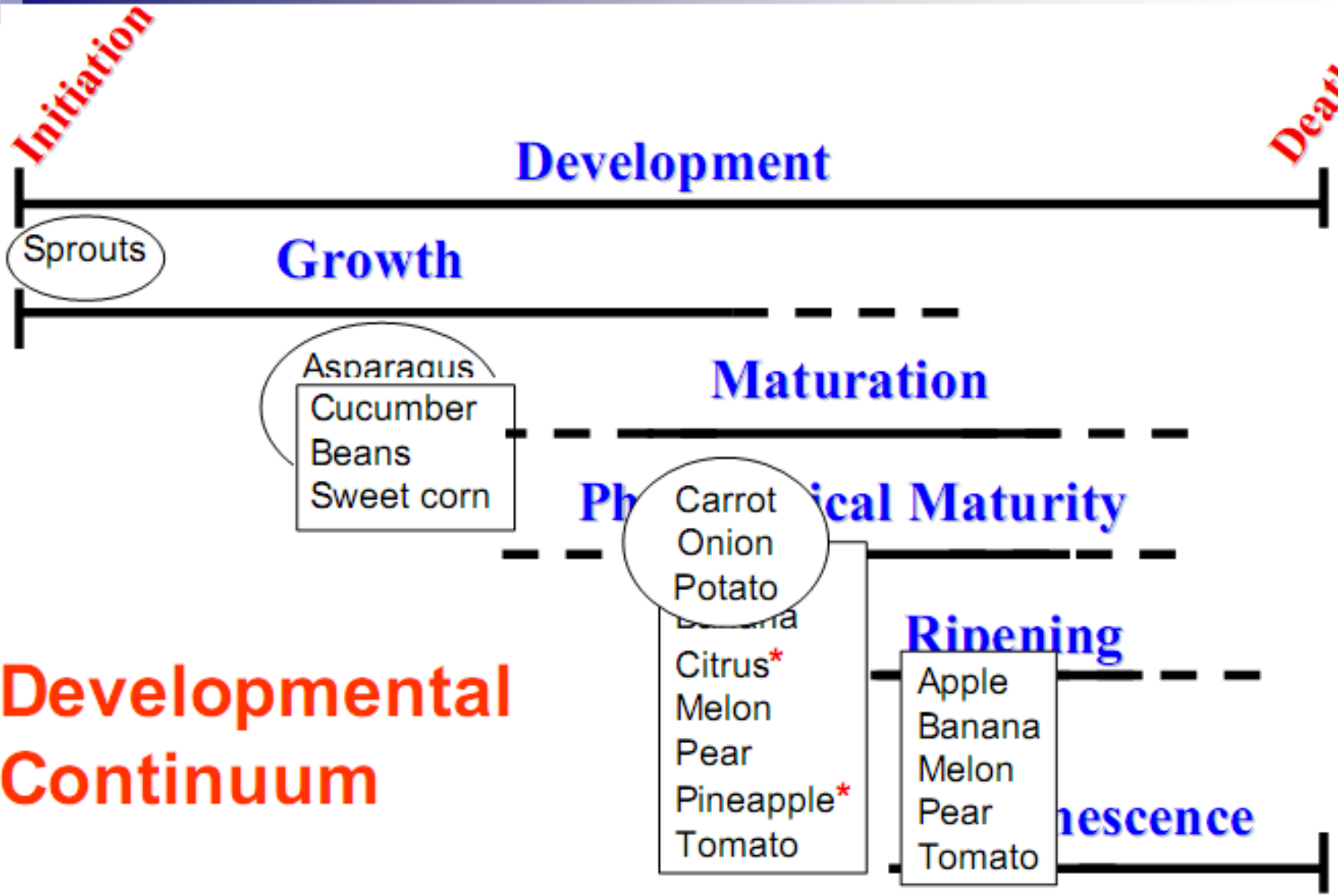
Horticultural maturity in relation to developmental stages of the plant. (Watada et al. 1984)



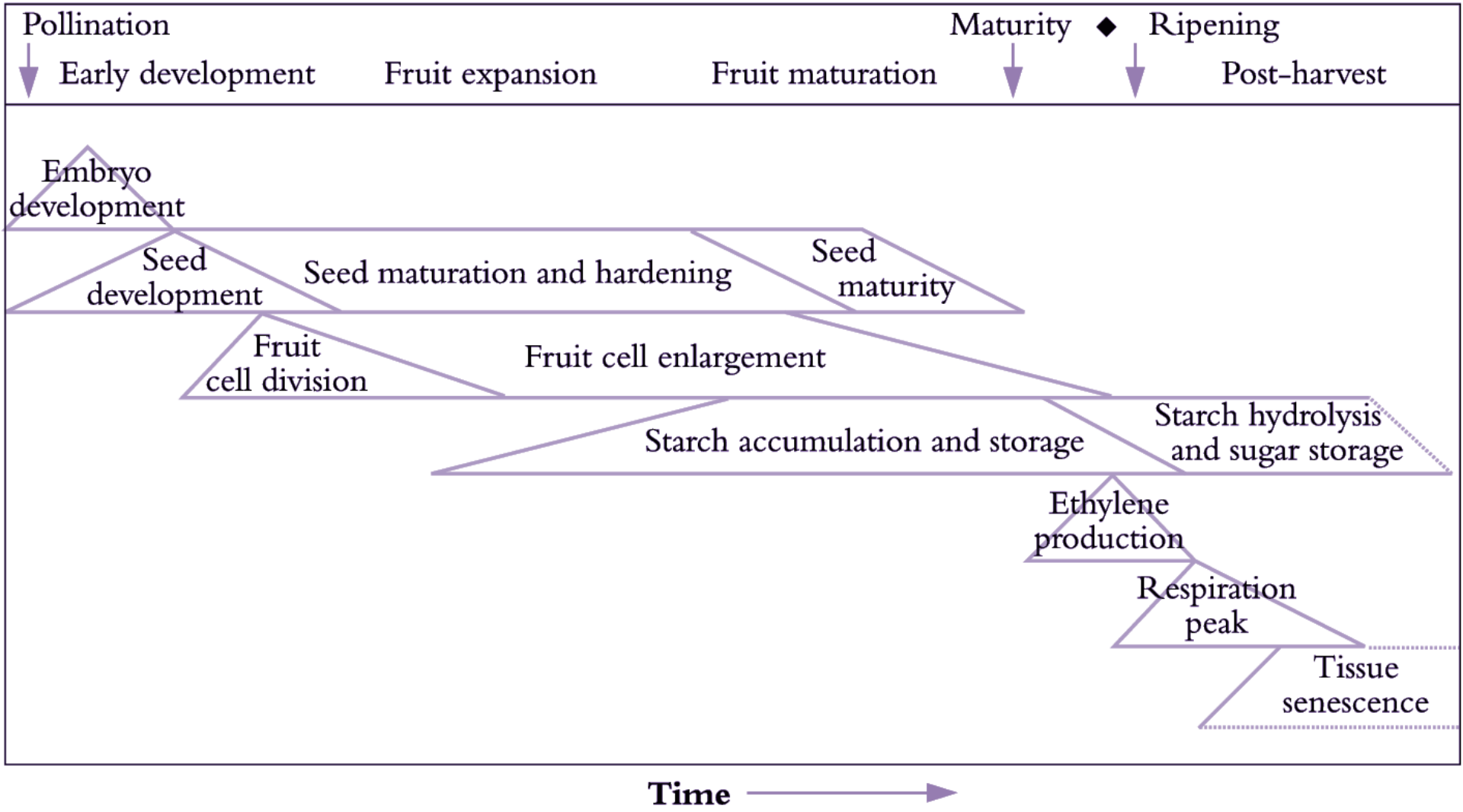


Developmental Continuum

Watada et al., 1984



Watada et al., 1984


Pollination
Maturity
Ripening
Early development
Fruit expansion
Fruit maturation
Post-harvest
Embryo development
Seed development
Seed maturation and hardening
Seed maturity
Fruit cell division
Fruit cell enlargement
Starch accumulation and storage
Starch hydrolysis and sugar storage
Ethylene production
Respiration peak
Tissue senescence
Time

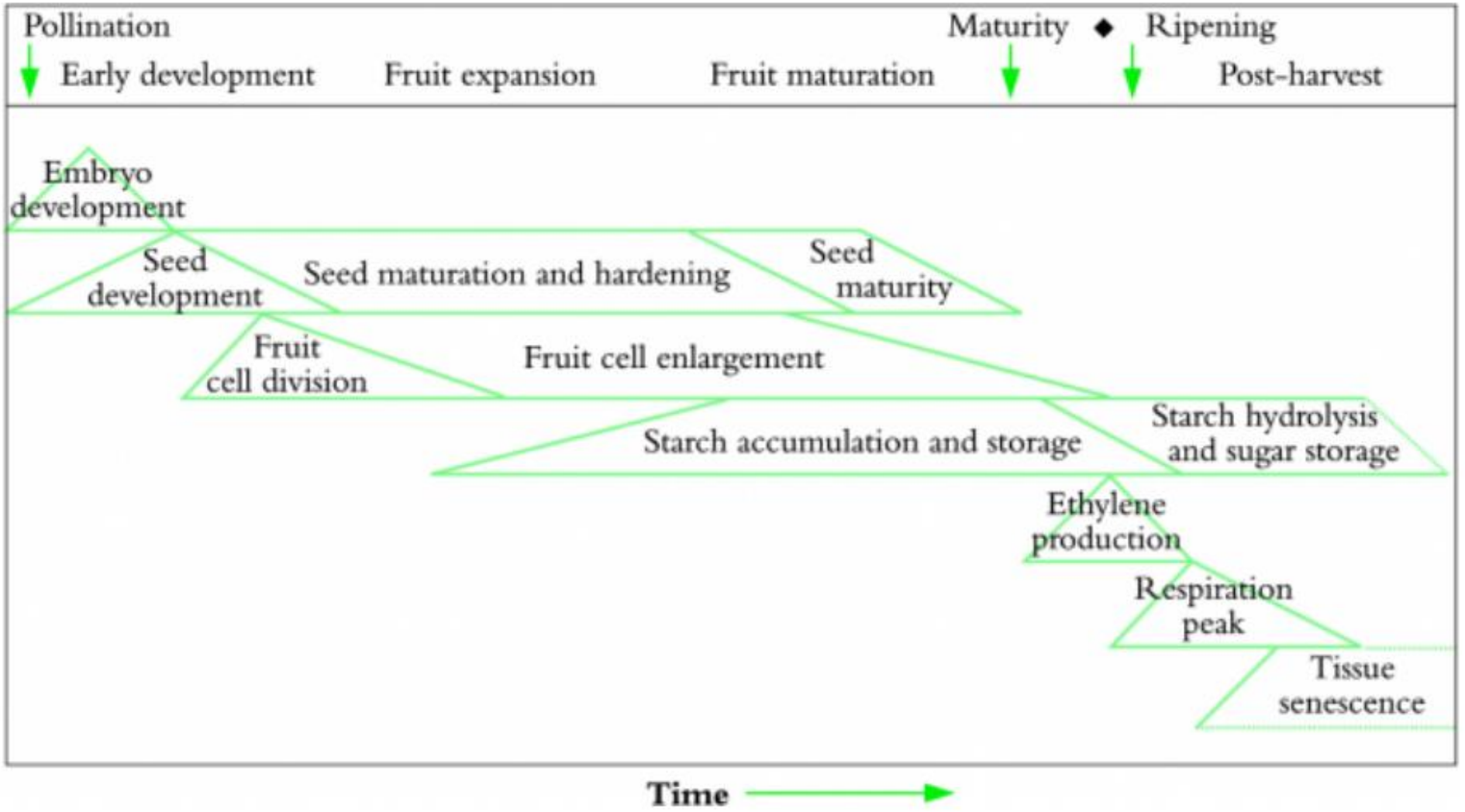


Figure 11.3 A great number of complex process are intergrated in space and time during seed developmnet and fruit growth and shown here schematically. In broad terms, embryo differentiation and seed development are already well advanced as pericarp enlargement gets underway, and seed maturation usually precedes onset of ripening; consequently fruits ingested prematurely still represent vehicles for seed dispersal. A phase of carbohydrate accumulation during fruit maturation gives way to starch hydrolosis and sugar storage during maturation, accompanied by a peak in ethylene output and respiratory activity as fruits ripen.

(Original diagram courtesy I.B. Ferguson)

زمان برداشت محصول

- برداشت در مرحله نابالغ (از نظر فیزیولوژیک نارس)
- برداشت در مرحله بالغ و نارس از نظر خوراکی
- برداشت در مرحله بالغ و رسیده

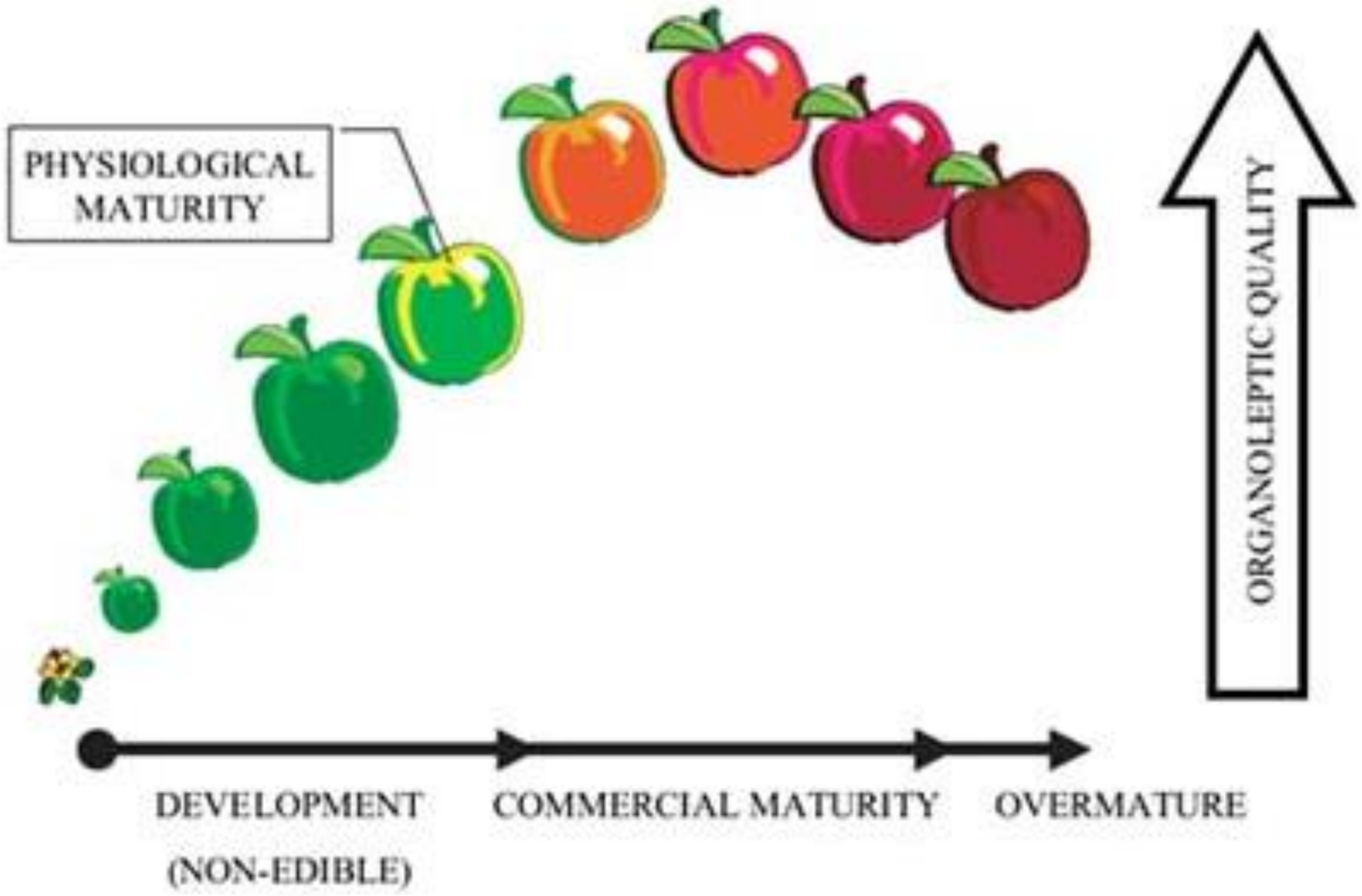


Figure 3: **Organoleptic quality of a fruit in relationship to its ripening stage.**

Terminology

PHYSIOLOGICAL MATURITY

The stage of development when a plant part will continue development even if detached; mature fruits

HORTICULTURAL MATURITY

The stage of development when a plant part possesses the necessary characteristics for use by consumers

در میوه هایی چون انبه، موز، پاپایا و گوجه فرنگی مرحله رسیدن فیزیولوژیکی(Physiological Maturity) یا مرحله بلوغ (Mature stage) یا رسیده سبز(Mature-green stage)، یا به عبارت دیگر مرحله بلوغ نارس(Mature unripe stage)، مرحله ای است که میوه هر چند که از نظر ظاهری نرسیده، سفت، به رنگ سبز و غیر قابل مصرف است، اما از نظر فیزیولوژیکی به حداکثر رشد خود رسیده است و در صورت برداشت از درخت می تواند سایر مراحل رسیدن خود را در انبار به طور طبیعی و یا به طور مصنوعی با افزودن گاز اتیلن و یا گاز استیلن (با استفاده از کاربید کلسیم) در محیط سپری کند.

بلوغ باغبانی یا تجاری عبارتست از مرحله ای از رشد و نمو که محصول قابل مصرف باشد.

Physiological Maturity

FRUITS

- Immature
- Mature
- Ripening
- Ripe
- Overripe

Horticultural Maturity

VEGETABLES

- Immature
- Mature
- Overmature