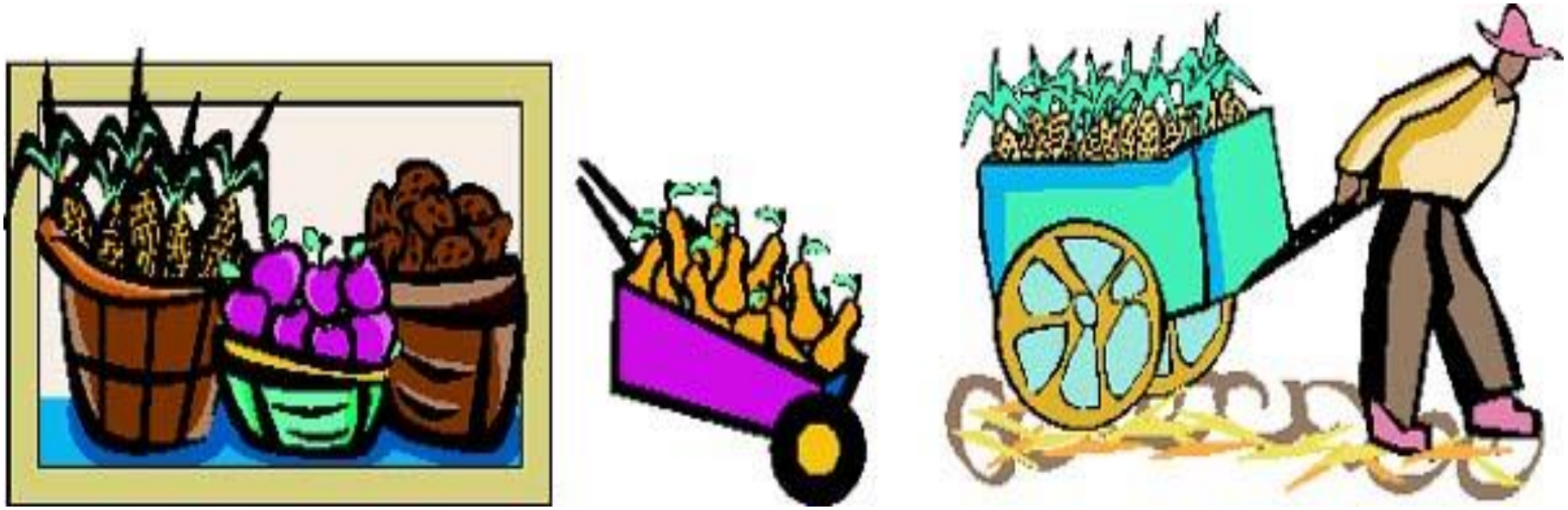
فناوری پس از برداشت ۴
(ابزارها و ظروف برداشت)

Harvesting containers

Harvesting containers must be easy to handle for workers picking fruits and vegetables in the field. Many crops are harvested into bags. Harvesting bags with shoulder or waist slings can be used for fruits with firm skins, like citrus fruits and avocados. These containers are made from a variety of materials such as paper, polyethylene film, sisal, hessian or woven polyethylene and are relatively cheap but give little protection to the crop against handling and transport damage. Sacks are commonly used for crops such as potatoes, onions, cassava, and pumpkins. Other types of field harvest containers include baskets, buckets, carts, and plastic crates (Figure 2.3). For high risk products, woven baskets and sacks are not recommended because of the risk of contamination.

Figure 2.3 Agricultural apple baskets, pear and corncob carriers.



Tools for harvesting

Depending on the type of fruit or vegetable, several devices are employed to harvest produce. Commonly used tools for fruit and vegetable harvesting are secateurs or knives, and hand held or pole mounted picking shears. When fruits or vegetables are difficult to catch, such as mangoes or avocados, a cushioning material is placed around the tree to prevent damage to the fruit when dropping from high trees.

FIG. 5.14 Harvest damage in pepper (left), pomegranate (middle) and mandarin (right) fruits.

FIG. 5.15 Different picking containers for harvest (Candir and Ozdemir, 2017).

FIG. 5.16 Using movable ladders for apple (left) and cherry (middle) and two-legged ladder (right) for cherry harvest. *(Courtesy of Ornek Tarim, Karaman, Turkey)*

FIG. 11.8 Different plastic containers are used for picking and transporting crops from the field to local markets or packing houses.

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FIG. 5.12 Splitting of hull in almond and almond harvest by using a long stick.

قیچی دسته بلند تلسکوپی مخصوص برداشت میوه های حساس

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Figure 5. Straight bladed hand shears for fruits and flowers:

Figure 6. Thin curved blade for grapes and fruits

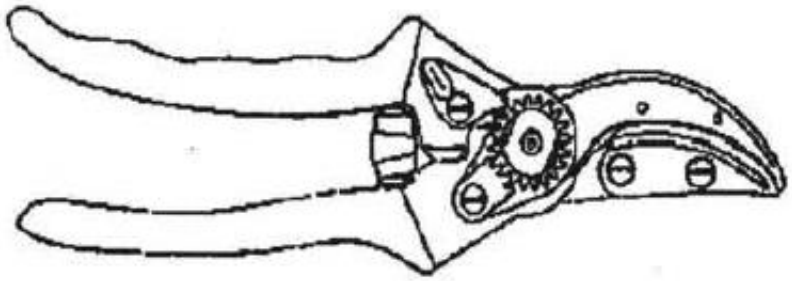


Figure 7. Cut and hold hand shears

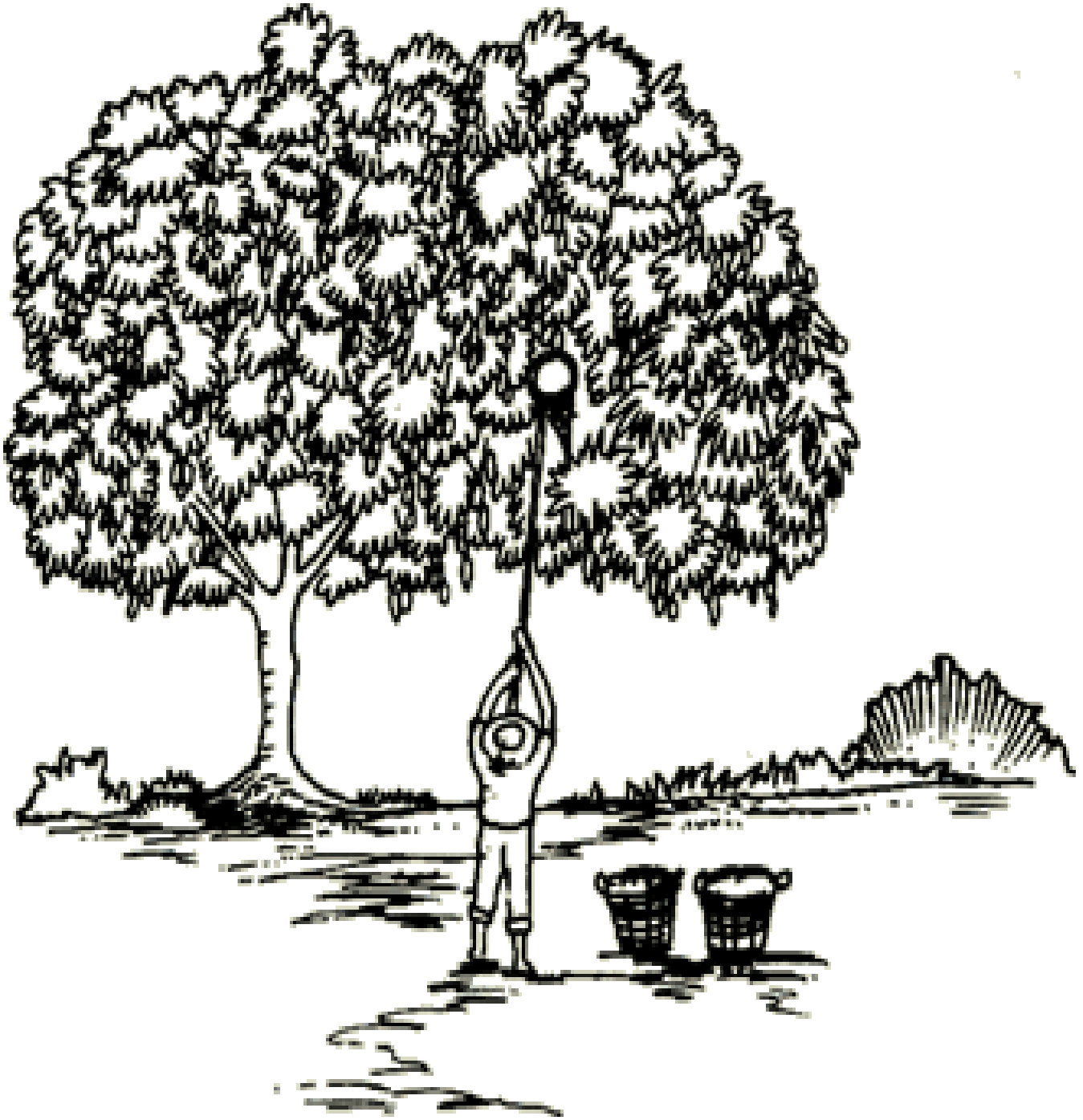


Figure 6.3 A mango harvest aid being used to remove mango fruit from the tree by cutting the pedicel and catching the severed fruit in the basket.

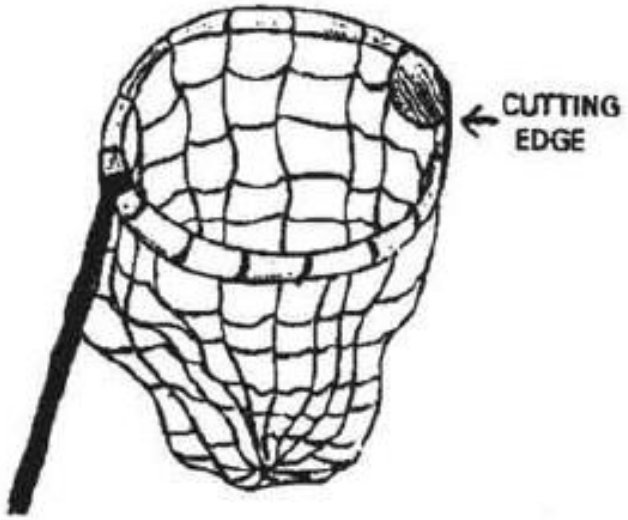


Figure 11. Hand woven collection bag

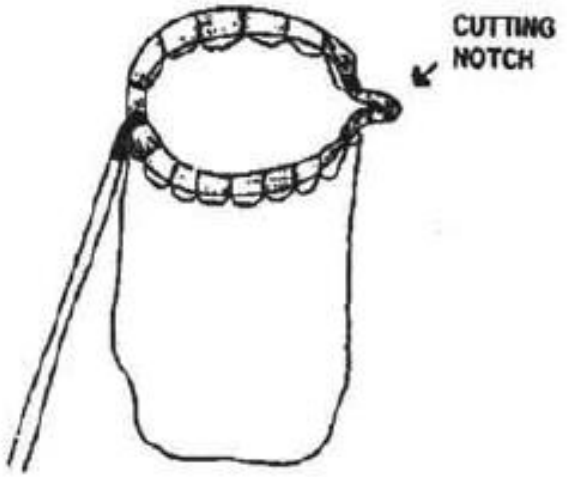


Figure 12. Canvas collection sack

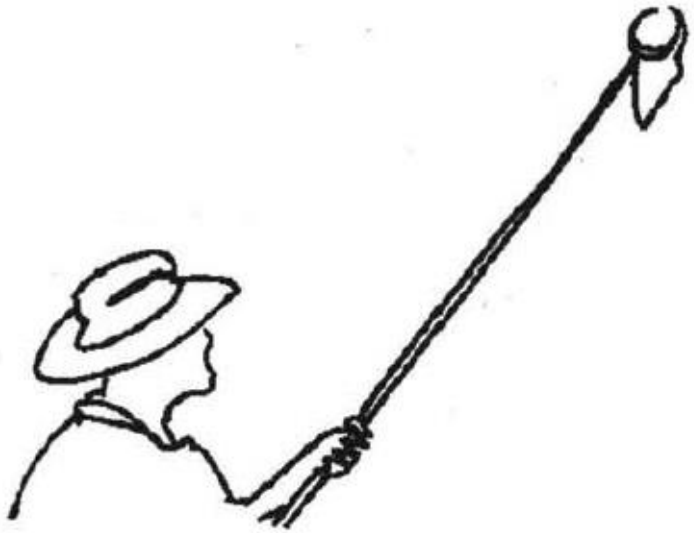


Figure 10. Using a picking pole

Harvesting bags with shoulder or waist slings can be used for fruits with firm skins, like citrus and avocados. They are easy to carry and leave both hands free.

Harvesting bags with shoulder or waist slings can be used for fruits with firm skins, like citrus and avocados. They are easy to carry and leave both hands free.

The contents of the bag are emptied through the bottom into a field container without tipping the bag. Plastic buckets are suitable containers for harvesting fruits that are easily crushed, such as tomato and strawberry. These containers should be smooth without any sharp edges that could damage the produce.

Plastic buckets

Peach harvest in plastic boxes.

برداشت گلرنگ

برداشت گلرنگ (کاربرد در صنایع غذایی و دارویی) روستای برسیان ۳۵ کیلومتری شرق اصفهان

Harvesting can be done by two methods:

1. Selective or multiple picking method

Selective harvest in cucumber (left) and fig fruits (right) (fruits in different development stages).

2. Strip picking method

The entire crop is picked or harvested at once. As there are variations in maturity levels of fruits on trees or plants, this method of harvesting is not recommended for many crops.

Harvesting Equipment

- Harvesting Bags and Containers



- Clippers and Knives
- Ladders



HARVESTING TYPES

1. Manual

Advantages

- Fruits and vegetables can be selected more precisely at the optimal maturity stage compared to mechanical harvesters.
- Fruit and vegetables are carefully handled and therefore damage is minimized.
- Manual harvesting requires minimum capital investment, but it can be expensive in the long-term.

Disadvantages

- Labor requirements can be a big, and expensive problem, particularly in developed countries.
- Harvesting can take quite a long time.
- Possible labor strikes during the harvest period can be a problem for growers.
- New workers may require intensive training.

2. **Semimechanical**

Semimechanical harvesting systems are used to reduce the disadvantages of both manual and mechanical harvesting systems are aimed to minimize harvest costs while increasing the harvest efficiency.

3. Mechanical

3.1- Limb shaker
3.2- Canopy shaker
3.3- Trunk shaker
3.4- Air blast
3.5- Robotic harvester

Advantages of mechanical harvesting:

- Reduce harvest cost
- Accelerate harvesting
- Use labor force effectively

Disadvantages of mechanical harvesting:

- No precise judgment for optimal maturity
- No selective harvesting
- Not appropriate for crops requiring multiple harvests
- May cause excessive damage to fruit and tree/plants
- Can be quite expensive for small scale orchards/fields

FIG. 5.20 Mechanical harvest in tomato (left) and rucola (right).

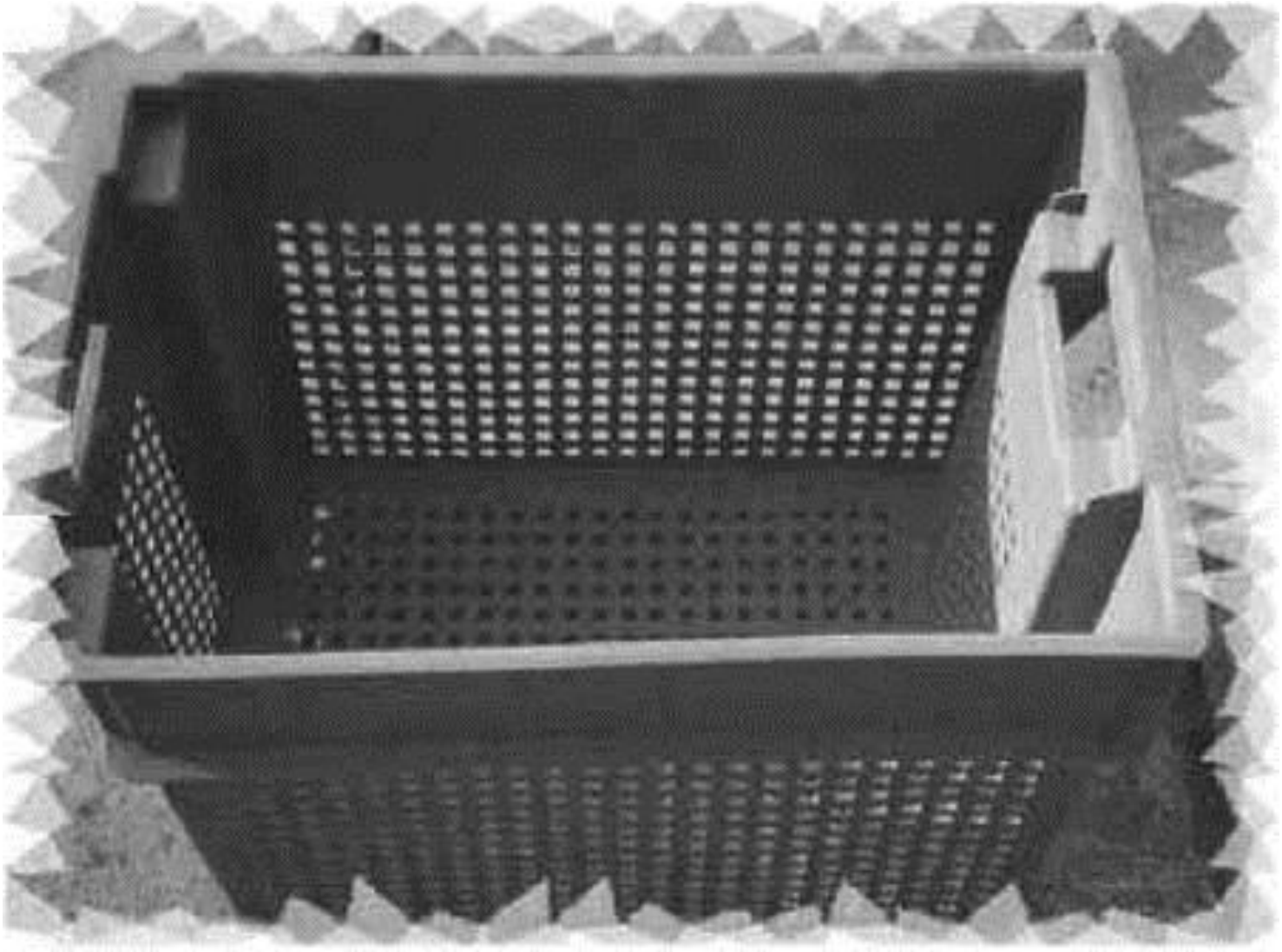
4. Use of Abscission Chemicals

Abscission chemicals can be used to loosen the mature fruit and accelerate the fruit removal rate. Moreover, abscission agents may enhance the development of the absiccion layer, resulting in lower mechanical forces to be applied during harvest and minimizing fruit damage. Some abscission layer-forming chemicals or agents used to help with the detachment of fruit from the tree include Ethephon, 1-aminocyclopropane-1-carboxylic acid (ACC), and 5-chloro-3-methyl-4-nitro-1H-pyrazole (CMNP).

Packing in the field and transport to packinghouse

- Berries picked for the fresh market (except blueberries and cranberries) are often mechanically harvested and usually packed into shipping containers. Careful harvesting, handling, and transporting of fruits and vegetables to packinghouses are necessary to preserve product quality.
- **Polyethylene bags:**
- Clear polyethylene bags are used to pack banana bunches in the field, which are then transported to the packinghouse by means of mechanical cableways running through the banana plantation. This technique of packaging and transporting bananas reduces damage to the fruit caused by improper handling.
- **Plastic field boxes:**
- These types of boxes are usually made of polyvinyl chloride, polypropylene, or polyethylene. They are durable and can last many years. Many are designed in such a way that they can nest inside each other when empty to facilitate transport, and can stack one on top of the other without crushing the fruit when full (Figure 2.4).

Figure 2.4 Plastic field boxes with nest/stack design



Dirt on field bin.

Washing plastic field bins.

A covered trailer with harvested herbs.

Wooden field boxes:

These boxes are made of thin pieces of wood bound together with wire. They come in two sizes: the bushel box with a volume of 2200 in^3 (36052 cm^3) and the half-bushel box. They are advantageous because they can be packed flat and are inexpensive, and thus could be non-returnable. They have the disadvantage of providing little protection from mechanical damage to the produce during transport. Rigid wooden boxes of different capacities are commonly used to transport produce to the packinghouse or to market. (Figure 2.5).

Bulk bins:

Bulk bins of 200-500 kg capacity are used for harvesting fresh fruits and vegetables. These bins are much more economical than the field boxes, both in terms of fruit carried per unit volume and durability, as well as in providing better protection to the product during transport to the packinghouse. They are made of wood and plastic materials. Dimensions for these bins in the United States are 48 × 40 in, and 120 × 100 cm in metric system countries. Approximate depth of bulk bins depends on the type of fruit or vegetable being transported (Table)

Approximate depth of bulk bins:

Commodity	Depth (cm)
Citrus	70
Pears, apples	50
Stone fruits	50
Tomatoes	40

Commercial growers use bulk bins with a capacity of 200-500 kg, in which crops such as lettuces and cabbages are placed, and sent to large scale packinghouses for selection, grading, and packing.