1 Orchard design

Site selection

Fruit trees are perennial crops. For good management and sustained yields, it is very important to select a good site for the orchard.

Climate

Temperature

The annual average temperature is very important. So is the range of variation in temperature during the vegetative growth stage, and the minimum temperature in the coolest month. All these are significant factors which should be considered in site selection. It should be remembered that the optimum temperature range for citrus is between 20°C and 28°C.

Rainfall

In general, a climate with low rainfall and plenty of sunshine is good for citrus trees. It promotes good flower differentiation, flower and fruit development, and fruit quality. High-rainfall areas are less suitable for citrus. They have a higher pest and disease burden, lower yields and poor fruit quality. As well as the total rainfall during the year, growers selecting a site should also consider the distribution of rainfall at different seasons and different times of day. They should also consider rainfall intensity, duration and frequency.

Wind

Flowering, pollination and fruit drop are all affected by the wind. Breeze is helpful to promote air flow inside orchards.

On the other hand, strong winds, cold winds and sea winds are harmful for the growth of both trees and fruit. Windbreaks, or some other kind of protection against the wind, are essential for orchards in such areas.

Frost

Frost can damage trees, especially at the time of:
- Budburst;
- Flowering, and
- The early stage of fruit development.

Growers should be aware of the times when any frost is likely to occur during the year.

Other important points

Day length, the amount of sunshine and the level of relative humidity may all affect shoot growth, flower differentiation, fruit quality, and the severity of pests and diseases. The citrus tree needs bright light during the daytime, and a high level of relative humidity, for good shoot growth and fruit development.

Terrain

Latitude, elevation and slope can all affect the temperature, the rainfall, the level of solar radiation, and the strength and direction of the prevailing wind. All these in turn will affect fruit tree growth, fruit yield and quality. They also affect the way in which orchard operations can be carried out.
Soil and drainage

Suitable soil texture and structure, water storage and drainage are all crucial for fruit tree growth. Fruit trees can grow and produce well in a wide variety of soil types, except very light, sandy soils and heavy clay soils. In general, most fruit trees prefer the soil pH to be between 5.5 and 6.5.

It is important to know about both the surface drainage and the subsurface drainage, particularly in clay soil. In general, the water table should be no higher than one meter below the soil surface.

Availability of irrigation water

In most areas, irrigation is essential for growing fruit trees. Before deciding on an orchard site, growers should collect information about the water supplies available.

Electricity

For some large orchard operations, electricity is needed to run the irrigation systems, the office which is the orchard’s management center, and the storage facilities.

Economics

Before setting up an orchard, growers should try to work out whether it is likely to be profitable. In doing this, they should consider:

- The scale of orchard operations;
- Labor demand, labor cost, and the availability of labor;
- Access to markets and market demand;
- Transportation for harvested fruit, to deliver it to the market or collection center; and,
- The price of the land.

Planning the orchard

Collection of information

This involves basic information about the site location, including the terrain, climate and soil, and transportation.

Agricultural activities in the surrounding area, and access to markets, are also very important. Information on all these points should be collected before the orchard site is finally chosen.

Selecting the kind of citrus

When growers decide what citrus varieties to plant, they need to consider the orchard environment, and the market demand for different kinds of citrus fruit. They should also think about what cultivation techniques they plan to use, and the kind of field management. They must be sure that the varieties they choose are suitable for their style of management.
Orchard layout

Most orchards are on sloping hilly land, where the conservation of soil and water is very important (Fig. 1-1). The orchard layout should avoid rapid runoff of rainwater down the slope.

An orchard on level ground should be divided into several blocks, separated from the other blocks by an access track about 2-3 meters wide. In general, access roads to the orchard and around the outside of it should be about 4-5 meters in width. Drains should be dug alongside the roads, to allow for drainage (Fig. 1-2). Roads that are used by motor vehicles and equipment should have some of the topsoil removed and replaced by a layer of gravel.

Irrigation

There are three main sources of irrigation water for orchards: wells, river and streams, and ponds. Wells use groundwater. The water must be pumped from the underground sources to be stored in a reservoir or water tower until it is needed.

Sometimes rivers and streams, or nearby ponds, can supply all the irrigation water that is needed. The water must be pumped to a reservoir. Care should be taken to ensure that the water is reasonably clean, and free of any toxic residues.

The irrigation system should be established when the orchard is being laid out. Underground irrigation pipes are preferred (Fig. 1-3). Furrow irrigation or over-canopy sprinklers can be used if water is abundant (Fig. 1-4). Drip irrigation or micro-sprinklers can be used if water is limited.

Soil improvement

Sometimes the orchard soil needs to be improved. The most common way of doing this is to improve the soil texture by applying compost and other organic fertilizers. If the soil is too acid, the pH should be adjusted with applications of lime.

Another common way of improving the soil is drainage, to lower the water table and ensure that the roots do not become waterlogged (Fig. 1-5). Underground tile drainage can be installed if the water table is high. Another aspect of soil that may need improvement is compacted layers in the subsoil. These may need to be broken up by deep plowing, or some other kind of field preparation.

If growers are unable to carry out the whole program of soil improvement for the whole site at one time, they can do it block by block, or start with the planting holes or rows.

Wind protection

Growers are recommended to plant windbreaks, in order to reduce wind damage to trees and fruit. Local tree species should be the first choice, provided their canopy is suitable for a windbreak.

Managing the orchard

Funds for inputs and other expenses, and also labor for farm operations, should be available all year round.

Site preparation

Getting the land ready

New fields should be cleared of stones and weeds. Old fields should be cleared of bushes and other unwanted vegetation.

Facilities

The kind and size of the facilities to be set up depend on the type of citrus varieties being grown, and the scale of the orchard. Common facilities include a packing house, and some kind of building for the storage of farm inputs, equipment and the harvested fruit.

Selection of planting materials

One of the most essential points in establishing a successful orchard is to plant healthy young trees from good-quality stock.
Fig. 1-4. Orchard with sprinkler irrigation and farm road

Fig. 1-5. Lowland orchard planted in soil with a high water table in southern Vietnam.

Ditches have been dug between the rows of trees and filled with the trunks and shoots of longan trees, which had been dug down and mixed with soil. The ditches were covered with a layer of coconut fiber, and the topsoil replaced. Because the ditches are underground, they do not interfere with the orchard operations.