Citrus Pruning

1 Pruning Principles

Learner Guide

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Introduction

Pruning is an essential production practice on citrus farms. If the right practices for the citrus types and conditions on the farm are applied at the right time of the year, the farmer will reap benefits in terms of production volumes of the desired fruit size, higher export pack-outs, more efficient pest and disease control, improved fruit colour and quality, better rind integrity, lower picking costs and greater efficiency in production practices.

Around South Africa citrus pruning strategies vary greatly. Some growers do annual maintenance pruning, while others only prune trees every three or four years. Some prune straight after picking, while others wait and prune closer to the end of winter. Some employ mechanical pruning, while others go nowhere near it and use only manual pruning, and some use a combination of the two.

No matter the pruning strategy, the same factors, expected outcomes and limitations are in play across the board.

Pruning Factors

What factors do we need to take into account when considering how best to achieve the outcomes that we want from pruning?

Citrus Tree Growth

Firstly, we need to understand how citrus trees grow and develop. Here we look at growth factors that have direct bearing on pruning, but we recommend that you watch the audio-visual module on Plant Structures and Functions where you will find more information on this subject.

Plant Metabolism and the Vascular System

The plant's vascular system consists mainly of xylem and phloem. Xylem transports water and nutrients from roots to leaves, where they are metabolised into food for the plant, in the form of carbohydrates. Phloem transports the food that has been metabolised by the leaves to other plant parts for storage. Roots, stems, trunks and leaves all contain vascular tissue that is connected and forms the vascular system of the plant.

How is food metabolised by leaves? Photosynthesis is the process by which green plants use sunlight to turn water and carbon dioxide into carbohydrates. These carbohydrates are stored in the plant until they are needed for vegetative growth, flowering and fruit growth. Respiration is the process by which stored carbohydrates are turned into energy in plant cells. During photosynthesis, half the water molecules absorbed by the plant are released back into the atmosphere through the leaves. This process is called transpiration.

In order for a plant to grow well and develop fruit of good quality and size, it is essential that its vascular system and metabolic processes are robust and efficient for photosynthesis to take place. For this, sunlight is critical. A citrus tree is geared to grow so that its leaves can get the maximum sun exposure.

By pruning we can open up the canopy of the tree to allow sunlight to penetrate, so that leaves, shoots and good quality fruiting wood develop throughout the canopy. When more healthy leaves are exposed to sunlight, transpiration and photosynthesis increase, producing more carbohydrates, which leads to higher respiration and means the tree and its fruit will be healthier and more robust.

Another relevant factor is the action plants use to transport water through xylem cells to leaves for photosynthesis. Xylem cells are tubes which do not actively transport substances. The plant depends on transpiration to "pull" water through xylem up to the leaves. If photosynthesis is sluggish because of a lack of sunlight, transpiration will also drop. Therefore, if there is little foliage in the shaded parts of the tree – such as a dead zone within the tree canopy – less water and nutrients are pulled to that part of the tree.

Tree Development

Citrus trees have two to five growth flushes per year, depending mostly on tree age. During each flush new stems, leaves and axillary buds grow. When buds are induced to flower, flowering shoots – which become fruit-bearing wood – grow from axillary buds of recent growth flushes.

Leaves and flowers develop and grow only where there is enough sunlight. If the tree canopy has been allowed to get so dense that it is shaded inside, all the flowers and fruiting wood will develop on the outside of the canopy, leaving a dead zone inside. At the same time, if trees have been allowed to grow too tall, they will shade the lower parts of tree canopies in neighbouring rows, forcing fruit-bearing wood and leaves to grow higher and higher up.

This complicates production practices and causes stems and shoots to dry out and die inside the shaded tree canopy, which makes deadwood. Deadwood is undesirable for a number of reasons, of which the most important are that it causes wind damage to fruit, and it plays host to latent pathogens.

New shoots can grow directly from older branches inside the canopy, often where pruning cuts were made or where deadwood was broken off. These water shoots often tend to grow very fast to get out of the canopy into the sunlight, and they tend to be thin and weak. Because they grow fast and tall, they are often responsible for increasing the tree height.

Another relevant aspect of foliar development is the response of the tree after pruning. Pruning induces new growth flush, causing new shoots and leaves to grow from places where cuts were made, and where previously shaded parts are now exposed to sufficient sunlight. If cuts were made on the outer shell of the canopy – as tend to happen with mechanical pruning – it means that the canopy will rapidly become even more over-grown, dense and shaded.

Structural Development

The natural structure of most citrus types consists of a central trunk from which a number of lateral scaffolding branches grow at different heights. Scaffolding branches develop into strong, thick branches, and they branch out further into smaller secondary branches.

It is important to keep branching as simple as possible. The further removed bearing wood is from the central trunk, the more inefficient the transport of water and nutrients to fruit becomes, which has a direct impact on fruit size. Bent or crossed branches are also not desirable.

Types, Cultivars and Rootstocks

The different growth habits of citrus types, cultivars and rootstocks are important in deciding the pruning strategy. It is essential that a grower must be familiar with the habits and requirements of the types, cultivars and rootstock under his management.

Vegetative Growth

With regard to vegetative growth, trees on rootstocks such as rough lemon tend to grow vigorously, which can exacerbate the problem of dense, shaded canopies and excessive tree size, especially in hot climates. Certain citrus types and cultivars, such as mandarins, lemons and Delta Valencias, also tend to grow more vigorously. Some mandarins hybrids, such as Nadorcott, Or and Mor, have the habit of growing long shoots from the central trunk, which grow upwards at a fast rate. These trees can rapidly become very tall and difficult to manage.

Fruit Bearing

In terms of where and how particular types or cultivars tend to bear fruit: orange and lemon types tend to bear single fruit on stems, while some mandarin cultivars tend to bear fruit in bunches, as can clearly be seen from the differences in how they flower. Grapefruit is sensitive to sunburn and develops a deeper colour in the shade, and we therefore encourage trees to bear fruit on the inside of the tree canopy away from direct sunlight.

Fruit Sets

Lemons have multiple fruit sets during a year, which is a unique characteristic. This means that at a given time one is likely to fruit in all stages on a tree, from bud to blossom to small fruit to mature fruit. This can make the timing of pruning challenging.

Alternate Bearing

Certain citrus types and cultivars are disposed to alternate bearing, which means that the tree will bear a lot of fruit one year and almost none the next season. This can have significant financial repercussions for a grower. Radical pruning, especially on young trees, can also force trees into alternate bearing. Pruning enables the careful management of fruit-bearing wood and can break alternate bearing cycles.

Climatic Conditions

The prevailing climatic conditions on the farm can have a significant impact on the pruning strategy that is employed.

Temperature

Transpiration, photosynthesis and respiration rates are all affected by temperature. Photosynthesis and transpiration is optimal between 15ºC and 35ºC. At 35ºC the stomata on the leaves close to prevent any further water loss. The respiration rate however keeps increasing as the temperature increases. This is why in hot areas, and in particular where night-time temperatures are high in summer and there are successive hot days, citrus trees tend to grow very vigorously.

Frost

At the other extreme, in areas where frost occurs during winter, new growth can die back if trees are pruned too early. Photosynthesis and transpiration slows down completely when temperatures drop below 10ºC, and respiration becomes sluggish, which means that little growth takes place. Even if there is no frost, low temperatures will inhibit regrowth after pruning.

Wind

Wind is a major cause of cosmetic damage to citrus fruit. In windy areas it is even more important to remove deadwood from inside the tree canopy to limit damage to fruit, and to prune young trees to have a balanced canopy less likely to be damaged by wind.

Tree Spacing

Tree spacing decides the space available to each tree canopy. In high-density plantings there is no space for each tree canopy to be flat and open, and trees are often allowed to grow taller. Trees in such orchards also form a hedge row sooner than in orchards with a more conventional tree spacing. In very low density plantings, on the other hand, there is space for the tree canopies to spread out, which requires a different approach to pruning.

Production Practices

Increasing the efficiency of production practices while keeping production costs as low as possible is central to the profitability of a citrus production unit. There are a number of essential production practices that are relevant to pruning.

Application of Agrochemicals

An agrochemical product is only as effective as its application. Applying spray material to trees that are too tall and too dense is ineffective and problematic. Spray material cannot penetrate a tree canopy that is too dense. This means that pests and pathogens inside the canopy can survive and flourish, a situation that is exacerbated if deadwood inside the canopy hosts latent pathogens. As a rule of thumb, if you look through a tree canopy and cannot see the trees in the row behind, the canopy is too dense to be penetrated effectively by spray material.

Trees that are too tall present a similar problem. Most spray machine towers have a maximum coverage height of around 4m. If trees are taller than this, spray material will not reach the crown of the tree. As an illustration, it has been found that there is a high prevalence of citrus blackspot in the crowns of tall trees, which poses a phytosanitary risk for the grower.

Agrochemical stem applications and spreading of granular fertilisers are made more difficult if workers struggle to access the space under trees. This can also make irrigation maintenance more difficult.

Citrus Disease Management

Phytophthora is a soil-borne disease that causes brown rot in citrus fruit. This is a particular danger for low-hanging fruit. If soil gets onto fruit, either by them touching the ground or by rainwater splashing up onto them, the risk of Phytophthora contamination is too high for fruit to be exported.

African citrus greening is a bacterial disease which results in the chronic decline of citrus trees. Once a tree is infected with the bacteria the tree can still be saved if the branches showing disease symptoms are removed. African citrus greening is spread by the vector Citrus psylla, which is attracted to new growth flush. It is important to scout for psylla on regrowth after pruning, and to put control measures in place. Citrus psylla also prefers the shade and is attracted to dense tree canopies.

Alternaria causes decay in oranges and cosmetic lesions on certain soft citrus varieties. The more dense the tree canopy, the more conducive the micro-climate for the development of the disease, and the less efficient the spray application of control products.

Picking

During the harvest pickers must be able to get into the tree canopies to reach all the ripe fruit on the tree. If trees are too high they need to use ladders, which is time-consuming, more costly, and can be dangerous if the ladders are too long. Ladders can also damage the tree and the fruit. It is much faster and safer if pickers can work from the ground.

Pruning Outcomes

What is it then that we want to achieve with pruning, taking into account all of the factors discussed above?

Improving Light Interception

Improved light interception inside the tree canopy is the first important outcome from pruning. Sunlight inside the canopy encourages the development of flowers, leaves and fruit throughout the canopy and increases productivity. There is also less deadwood and fewer water shoots in the canopy.

Increasing the fruit-bearing wood inside the canopy is essential. Remember that the impact of pruning will be seen the next season on early to midseason varieties if pruned directly after harvest, but two seasons on for late varieties like Valencias, when the fruit-bearing wood that is now enabled to grow will bear fruit. This long-term view is important, and must be kept firmly in mind.

There are, however, also more immediate benefits of improved light interception, in the improvement in fruit volumes, size and quality. Improved light interception will mean that the tree will be able to deliver more water and growth energy to the fruit, improving volumes, size and internal quality. It has also been found that greater light interception inside the canopy improves the integrity of the fruit rind, which fortifies the fruit against chilling injury and other physiological rind disorders.

Light interception is improved by making windows in the tree canopy, at the top or at the sides. Windows at the side are particularly suitable for cultivars where sunburn on fruit is an issue, as is the case with grapefruit. Ideally there should be dappled shade, almost like leopard spots, inside the canopy. This action will also thin out the canopy enough to allow spray material to penetrate.

Maintaining Tree Shape and Size

Tree height impacts on the efficiency of a number of production practices, and also causes shading of trees in neighbouring rows. Generally speaking, the ideal tree height depends on the space between rows. A guideline for calculating ideal tree height is to double the distance between rows, measured canopy to canopy. For example, for mature trees 1.8m is a practical distance to have between the canopies. This converts to an ideal tree height of 3.6m.

Keeping branching as simple as possible is another important outcome. The pruner must be on the lookout for crossed, bent or overly complex branches, because this compromises fruit quality. Pruning is also used to help young trees develop a desirable tree structure.

The spaces in between rows must be kept wide enough to be accessible for tractors and spray machines. There should also not be shoulders protruding into the rows.

Trees are skirted to keep the space under the canopies open and accessible. Skirting also limits the danger of fruit hanging on the ground and being exposed to Phytophthora contamination.

Row and Orchard Shape

Keeping trees in orchard rows uniform in terms of their shape and size makes production practices more efficient. For example, spray machines are usually calibrated for the largest trees in the row, and if many of the trees are smaller, a large amount of spray material is wasted. Uniformity is difficult to achieve and may not even be possible, because trees get injured or die. It is, however, still a desirable outcome worth pursuing.

Removing Unwanted Growth

Deadwood must be removed during pruning, as must all broken or damaged branches. Pruners must also be on the lookout for branches that may be infected with African citrus greening. If these branches are removed, the disease may not spread to the rest of the tree. Suckers that grow from the rootstock must also be removed.

Water shoots with triangular, green stems growing from the base of the canopy should be removed. However, if there is a shortage of fruit-bearing wood inside the tree canopy, which may be the case if the canopy has been too dense, water shoots originating from framework or secondary branches can be topped to about the length of a pruning shear to sprout and form bearing wood in the allotted space. Alternatively it can be bent and tied down below an old framework branch with its tip below the horizontal, so that it will grow thicker and can eventually replace the old framework branch. This is called stem rejuvenation.

Shaping Young Trees

Opinions differ on the age at which trees should first be pruned. If trees are pruned at too young an age, it will prolong their juvenility and limit development. On the other hand if left too long, the tree may grow too complex and develop a dense canopy, which will require radical pruning. Best practice advocates lightly and selectively pruning trees from as young as one or two years to manage their shape, to maintain balance in the canopy, and to encourage framework development. Regular light pruning also encourages foliage development.

Preventing Radical Pruning

If trees are pruned properly every year, and they are not subjected to extraordinary stress, it is possible to maintain the trees and orchard very close to an ideal state for its whole lifespan without ever having to take radical pruning action.

However, if pruning has been neglected, or if trees have been subjected to extraordinary stress or damage, such as from disease, hail, windstorms, floods, lightning, frost or severe drought, or if it has been damaged mechanically, it is necessary to take corrective pruning action, which may have to be quite radical.

Although it is of course not always possible to avoid extraordinary stress and damage to trees, it is better to have a regular maintenance pruning programme in place that avoids radical pruning as a result of neglect. Heavy, radical pruning removes a lot of the total tree mass, including foliage and quality fruit-bearing wood. This is a shock to the tree. A wild regrowth response is likely, along with a drastically lower yield at least in the first year after pruning. Trees could even be forced into an alternate bearing cycle.

In cases where pruning has been neglected and trees have grown too big and dense, it is better to improve light interception and bring height and spread down gradually, over two to three years.

Timing of Pruning

When and how often do we prune? Young trees not yet in production are pruned more than once a year until they come to fruit-bearing age. Once trees are in production, they are pruned at least twice a year. The main pruning is usually done in winter soon after picking has been completed, followed by summer pruning which is important to manage regrowth and maintain light distribution in the canopy. However, managing regrowth throughout the season is recommended.

The timing of winter pruning is important. Ideally, the best time to prune is during the coldest period of the winter to reduce the intensity of regrowth. However, in practice we prune directly after harvest in order to have sufficient time to prune all the orchards.

Best practice is to follow up winter pruning with summer pruning to remove unwanted regrowth, particularly where an aggressive regrowth response tends to occur. On most cultivars, especially soft citrus varieties, it is desirable to prune more regularly during the year to control regrowth and manage the density of the canopy. If summer pruning is neglected it may cause the canopy to become dense and shaded before the fruit inside the canopy has matured.

Pruning Methods

Pruning can be done manually or mechanically.

Manual Pruning

Manual pruning is done by hand. The benefit of manual pruning is that it allows one to be selective in terms of the vegetation that is removed, and it also allows one to make cuts inside the canopy. It is, however, also labour-intensive and slow, and requires trained pruners.

Pruners must be given instructions that precisely set out what they need to do. How many windows must be cut in each tree? How high should the trees be? What should the minimum canopy to canopy distance be between rows? Should they remove water shoots, or top or bend them? At what height should trees be skirted? In the Citrus Pruning Practices module we look at how these instructions are executed.

Manual pruning requires equipment. In the Pruning Equipment module we look at what equipment is suitable for different tasks, and we also look at how equipment should be cleaned and maintained. On principle, however, it is important to buy the best quality equipment you can afford, and to make sure that it lasts by incentivising workers to take care of their equipment. Using cheap, poor quality equipment leads to inefficiency, higher costs, and it can cause damage to trees and injury to workers.

Mechanical Pruning

Mechanical pruning makes use of machines with large blades that drive in orchard rows and cut trees back. It is the best way to cut trees in a row into the same size and shape, and to bring down trees to a uniform size.

Mechanical pruning removes vegetation in bulk without being selective. By its very nature it makes a multitude of small cuts on the outside of the canopy. This means that the tree has a wild regrowth response which results in bushing where the vegetation was removed, often in the shape of chicken feet. This can cause canopies to become even denser and more shaded. It must also be noted that the bearing wood on dense trees is on the outside of the canopy where there is sufficient sunlight. By using mechanical pruning, most of this bearing wood will be removed.

It is therefore impossible to achieve the desired results with mechanical pruning alone, and it should always be used in combination with manual pruning.

Post-Pruning Care

Once pruning has been completed, we need to deal with cut vegetation on the orchard floor, open pruning wounds, and exposed tree trunks.

It is practical to mulch cut vegetation in the orchard and spread it under the trees. This has the added benefits of limiting evaporation from the soil, and of allowing the vegetation to breakdown to compost in the orchard. It is, however, important that it must be mulched fine enough to allow for composting.

Best practice is to treat all pruning wounds with a diameter of more than 2.5cm with wound sealant. This will protect the wounds from secondary pathogens, and will decrease the chances of dieback.

If trees have been pruned radically and the trunk and branches have been exposed to direct sunlight, it is important to protect them against sunburn. Applying diluted white PVA paint is an effective sunscreen.

Conclusion

Pruning should not be viewed as a cost item for a farm. If the correct pruning strategy is employed, it can make a significant contribution to the income generated by the farm. This should be the aim of every production manager – to employ pruning as a central strategy to improving yields, exports and income.

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2 Pruning Equipment

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Introduction

Choosing the right pruning equipment and making sure that the equipment is working properly before pruning starts is half the battle won. In this module we look at the equipment that is used for pruning, how to choose the right tool for the right job, and how to clean, maintain and store the equipment to get the best and longest use out of it.

Pruning Equipment and Uses

There are a number of pruning equipment brands, ranging widely in price and quality. As with everything else, you need to remember that what you pay for is what you get. You need to carefully weigh up saving money in the short term against having to replace equipment regularly. Poor quality equipment may also make pruning slower and less productive, and even cause damage to trees and injury to pruners.

Using the wrong equipment for a particular pruning action, or not properly maintaining and repairing equipment, can also slow down the pruning process and cause damage to trees.

Pruning Shears

The first pruning tool is pruning shears. Pruning shears can be used to cut branches up to thirty millimetres in diameter, which is about the thickness of a broomstick. You have to be careful while using pruning shears, because you can easily remove fruit-bearing wood. It is best to use pruning shears mostly for skirting, and to use a lopper or a pruning saw for cutting branches with a bigger diameter inside the tree canopy.

Pruning shears are available in different types, shapes and sizes, and it is helpful for workers to select the shears most suitable to them. For instance, workers with smaller hands will prune much quicker and better if they have smaller pruning shears that they can handle easily, while left-handed workers need left-handed pruning shears.

Loppers

Loppers are larger than pruning shears, and have long handles. Loppers are meant for cutting branches of up to 45mm and can also reach further.

Mechanised loppers and pruning shears are either battery-driven or pneumatic. They are much more powerful than hand-operated shears and loppers, and can cut smoothly and evenly through branches. They are considerably more expensive than manual shears and loppers, but may be worth the cost for the sake of efficiency, productivity and limiting damage to trees.

Pruning Saw

A pruning saw is a small saw that is used with one hand, and is used to make most cuts while pruning. Some types of pruning saws fold up, which make them safer to use and carry, while others with longer blades come with a sheath. Pruning saws usually only cut in one direction. Forcing them too hard in the wrong direction can warp and break the blade.

Other Saws

Larger saws, such as bow saws, wood saws and chain saws, are sometimes used during pruning because they can speed up the work. It is, however, not advisable to use bow and chain saws because they make rough cuts which are more vulnerable to infections. They are mostly used to cut tree trunks for re-grafting, or to remove large branches.

Other Equipment

While pruning you will also need a few other things. Strong PVC gloves are useful for protecting your hands while pruning, especially for citrus varieties that are thorny. A skirting stick that is as long as the required skirting height is also useful, as is a stick the length of the required tree height. For high trees you will need a ladder, although most pruners prefer to climb the trees to make cuts inside the canopy.

Equipment Maintenance

If you look after your pruning equipment it can last for many years. Proper maintenance matters even more if you want to use high-quality, expensive tools productively for a long time.

Maintaining Pruning Shears and Loppers

Pruning shears and loppers are similar in terms of their parts and the manner in which they have to be maintained. In this section we refer to pruning shears, but all of the tasks are equally applicable to loppers.

Before we look at maintenance practices for shears, you need to know their parts and understand the role each part plays. Your pruning shears may look slightly different from this, but you should be able to identify all the parts that we have labelled here.

The handles of pruning shears are normally covered in a non-slip coating and designed to fit into a hand comfortably, so that they can be used for long periods without causing pain. The volute spring, which is a spring that forms a spiral, allows the shears to open and close smoothly. Rubber pads on the handles act as shock-absorbers, which makes shears more comfortable to use and increase productivity. The larger of the two blades is called the cutting blade, while the other is the anvil blade. The blades bypass, much like the blades of scissors. The centre nut can be loosened or tightened to adjust the blades, and the locknut keeps the centre nut in position with interlocking teeth. The thumb lock makes it easy to lock the shears when they are closed.

Before pruning starts for the season, pruning shears must be cleaned thoroughly, greased and checked. Look closely at the blades to see whether they need to be replaced.

While you are pruning, it is important to check your shears every day, and to sterilise them regularly. You should also sharpen the blades at least once a week. We do this after cleaning and greasing the shears. Once pruning is over pruning shears must be cleaned thoroughly, oiled and greased where necessary, before being stored.

Checking Pruning Shears

Check that your shears are in a good working condition before pruning starts and regularly during pruning. Check that the volute spring is clean and has the right tension. It should be relatively easy to push in, but it should then kick out strongly when you let go. Check that the blades are clean and sharp, and check the blade alignment, which we discuss in more detail later on in the section about adjusting blades. If the shears are just coming out of storage, check for rust. If you hold the shears horizontally in your hand and drop the top handle to close them, the cutting blade should close about two thirds down the length of the anvil blade.

Cleaning Pruning Shears

Pruning shears get covered in sap and bits of the tree while pruning, and they have to be cleaned thoroughly to prevent damage and to keep them working smoothly.

You will need soapy water in a bowl or in a spray bottle, a sponge scouring pad and a cloth or paper towel, and a spanner that fits the locknut screw on your shears. You need to take the shears apart to clean them properly. Please check the instructions for your make of pruning shears to be sure, but it should involve the following steps.

Remove the spring and put it in the soapy water. Loosen the locknut screw and remove the locknut and centre bolt and nut. Separate the handles and the blades. Spray all the parts with soapy water. Scour the parts with the scourer. Never use a steel pad, as this will remove too much metal. Rinse all the parts, pushing the spring in and out. Dry each part. In particular, make sure that the indent in the bottom half of the anvil blade and the anvil blade itself is clean and dry. Be careful when working with the cutting blade, remember it is sharp.

Sterilising Pruning Shears

Pruning shears that are not properly sterilised can transmit diseases between trees. Best practice is to sterilise your shears after every row, and every time you change cultivars.

You can use either a container in which you can dip the blades, or you can use a spray bottle that you can carry with you. Apply the product, shake off the excess water, and you can continue working.

Greasing Pruning Shears

Pruning shears must be greased, and not oiled. Put a little grease in the indent in the anvil blade, around the hole through which the centre nut goes, and grease the central bolt and nut.

Reassemble the shears, checking that the parts fit properly and snugly. Replace the centre nut and bolt, tighten the nut, and replace the locknut and its screw. Spray a little lubricant oil on the spring before replacing it.

Adjusting Blades

When the blades of pruning shears are properly aligned they are neither too close nor too far apart. If they are too tight, it will be more difficult to open and close the shears, and it will slow you down. If they are too loose, they will not cut cleanly, which will also slow you down and may even cause damage to stems and branches. You can check whether the alignment is right by removing the spring and holding the shears in your hand so that the anvil blade is at the bottom. Lift the top handle and drop it down. The shears should close to about two thirds along the length of the anvil blade. If they are too loose, they will close all the way, and if they are too tight, they will not close far enough along the anvil blade.

To adjust the blades, with the spring removed, loosen the locknut screw and remove the locknut. Adjust the centre nut until the blades close just right. Replace the locknut and the locknut screw, and replace the spring.

Sharpening Blades

To sharpen pruning shear blades you must use the correct sharpener or sharpening stone. Never use sandpaper or metal files.

To sharpen the blade, open the shears and hold them flat in the left hand with your fingers between the handles. The sharpener should be at an angle of about 23º. This means that if this is 0º, and this is 90º, halfway would be 45º. Halfway between that and the blade gives you the right angle of about 23º. Move the sharpener a few times along the sloped edge of the blade or use circling motions while keeping it at the right angle. Don't just work in one area, though, as this will make the edge uneven. Don't use too many strokes at a time, but rather sharpen the blade every day with two or three strokes. When you are done, turn the shears over and clean the burring from the straight edge of the blade, using the sharpening stone at a 5º angle.

Replacing Blades

When the cutting blade no longer bypasses the anvil blade perfectly along its entire length, it needs to be replaced. You will find specific guidelines for replacing the blades of your make of pruning shears, but generally it involves the following steps.

Take the shears apart as for cleaning. Make sure that the replacement blade is the right one for your model shears. Grease and reassemble the shears again with the new blade in place, and then adjust the alignment of the blades.

It might sometimes be necessary to replace other moving parts during the season as well, so check your shears regularly and follow the manufacturer's instructions.

Maintaining Pruning Saws

Saws are much easier to maintain than shears. As long as they are kept clean and sterile, they should remain in good working order. A pruning saw is cleaned by simply spraying soapy water on the blade and wiping it carefully with a cloth, and it is sterilised using the same method as for pruning shears. Remember to also sterilise your pruning saw between rows and whenever you change cultivars.

You may, however, from time to time need to replace a saw blade. The blades of pruning saws can break if you push them too hard in the wrong direction and they twist.

To replace the blade, remove the bolt and nut in the handles, pull the blade out, and push the new blade into position so that the hole for the bolt lines up with those in the handle. Replace the bolt and nut, and tighten them. On a larger pruning saw you may have two bolts that you need to remove.

Managing Pruning Equipment

Here are a few simple steps that will help to make sure that a grower gets the best use out of this equipment during pruning.

Generally speaking, it is good management practice to issue pruning shears and pruning saws to individual workers before pruning starts, and to have a worker use the same tools the whole time. Keeping tools clean, sterile and in good working order makes pruning easier and quicker, and workers who take responsibility for their own tools are able to take advantage of this.

Keep a small box with emergency parts for shears and saws on hand during pruning. Small problems with tools can then be solved immediately without wasting time. A screwdriver and spanner for taking shears and saws apart should also be in this emergency toolkit, along with sharpening stones and cleaning material.

Lastly, check the warranties and guarantees when you buy new equipment. Making use of the free replacement parts can mean considerable cost savings. Some manufacturers have a lifetime guarantee on parts of the shears, such as the handles.

Storing Pruning Equipment

Tools and equipment must be stored in a cool, dry, secure area where they are protected from the elements. To prevent rust, spray them with a little oil, wiping away the excess.

Conclusion

The best trained pruners will not be able to do their work well if they do not have the right tools and equipment. Buy the best equipment you can afford, put measures in place to keep tools in the best possible condition, and make sure that problems can be solved as soon as they occur while pruning.

Citrus Pruning

3 Pruning Practices

Learner Guide

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Grower levies working for you!

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Introduction

Citrus trees are pruned to get more light into the canopy of the trees, to keep the trees from growing too big and tall, and to remove unwanted parts, like deadwood and water shoots. How trees on a particular farm have to be pruned depends on a few factors, including the age of the trees, the size and shape of the trees, the planting density, the type of citrus, and whether there is anything specific that must be corrected with pruning.

A pruning team will usually get a clear instruction and demonstration from the farm manager on how the trees in an orchard need to be pruned. The pruning team must follow these instructions for every tree in that orchard, so that all of the trees will be similar in their shape, size and growth.

The golden rules for a pruner is, firstly, to always cut less rather than more. You can always go back and remove one or two more branches if you have not pruned enough, but you can never undo cuts when you have pruned too much. The second golden rule is never to cut too much fruit-bearing wood. When you are working inside a tree canopy you should be removing deadwood, broken branches, poor quality bearing wood, crossing branches, double branches, greening branches and water shoots.

Health and Safety

To prune citrus trees you will use mostly pruning shears and a pruning saw. Make sure that your tools are sharp and working properly, so that you can prune quickly and won't damage the trees. You must always remember that there is the danger of getting injured by one of these sharp tools. Be careful to only use the tools in the correct way, and to carry and store them safely. If any of your equipment becomes damaged, report it immediately to your supervisor. Wear thick PVC gloves while you are pruning to protect your hands and forearms, especially when you are working on thorny trees.

One of the most common pruning injuries is muscle injury to the hand that holds the pruning shears. The repetitive motion of cutting can cause your hand to cramp. It is important to use the right size shears for your hand, preferably with shock absorbers, and rest your hand every now and again. If you find that your hand keeps getting sore and tired, check your shears. The blades might be blunt or out of alignment, or the shears may need to be greased. You can also lightly push down on the branch that you are cutting with your other hand to ease the pressure on the blade of the pruning shear. This will allow for much less tension on your pruning hand.

Preferably, pruners should not climb into trees as this is a way of spreading Phytophthora into the tree, causing bark scaling and even branch canker. The best practise is to make use of ladders. When you are using a ladder, make sure that it is secure against the tree and safe for you to climb.

If you should get injured, ask for help immediately and get treatment. There should be a first aid kit with the pruning team in the orchard so that small injuries can be treated there and then.

Pruning Actions – Mature Trees

There are six basic pruning actions that are used on mature citrus trees. The instruction from the farm manager will tell you which of these actions are needed in a particular orchard.

Cutting Windows

Windows are cut in the canopy of a citrus tree to allow more light into the inside of the canopy, where we want more fruit to grow. To cut windows, select two or three branches and saw them off as deep into the tree as you can, which means as close as possible to the place where they grow out of their mother branch.

The best branches to select are those that grow out of the tree making it too tall. This will make windows in the top of the tree. Windows should be cut into the side of the tree as well. Make sure that you select the right branch and that you know where the window will be once you have cut the branch.

Be careful whenever you use a pruning saw. They are made to saw only in one direction, usually when you pull them towards you. If you try to saw when pushing the saw, you can twist and break the blade.

Removing Water Shoots

Water shoots are new shoots that grow out of old branches. They usually grow inside the tree canopy, and they are long and thin and will often grow right out of the top of the tree. Use your pruning shears or pruning saw to cut the shoot flush with the branch that it grows out of.

Sometimes, if there is no other green shoots growing inside a tree canopy, you may be told to leave a part of the water shoot, about the length of your pruning shear.

Remove water shoots growing from the base of the framework, as they become very vigorous and cause shading on the inside of the canopy. Also be on the lookout for shoots that grow from the rootstock, which is the main trunk of the tree close to the ground. Break them off whenever you see them.

Removing Deadwood

Deadwood is dry, hard twigs or branches inside the tree canopy. The best way to remove deadwood is to break it off with your hand while wearing gloves. If it is too thick for you to break it, use your pruning saw.

Removing Crossed Branches

Look inside the tree canopy for branches that have grown crossed or twisted with other branches. Saw these branches off as deep as you can.

Skirting

Skirting means removing or cutting back branches and twigs that grow close to the ground. This is done so that there won't be fruit hanging too close to the ground. Use your pruning shears to cut off everything that hangs below the skirting height. It is useful to have a skirting stick that shows you the correct skirting height.

If you find a branch that is partly lying on the ground, cut it back to where it forms a strong scaffold, or of that is not possible, saw that branch off inside the tree, as deep as you can.

Removing Shoulders

Some trees grow to have shoulders, which you will see at the top of the tree canopy on the sides of the tree that go into the space between the tree rows. If these shoulders are left they will cause shading lower down in the tree and will also make it more difficult for spray machines to get into the orchard.

See what branches are making the shoulders, and saw them off them as deep into the canopy as you can. This action will also open up windows in the side of the tree canopy.

Pruning Procedures – Mature Trees

There are generally two types of pruning procedures for citrus orchards. The one is maintenance pruning, which is usually done every year. Sometimes it is necessary to do corrective pruning, when trees have been damaged by disease, hail, frost, floods, lightning or severe droughts. Corrective pruning is also sometimes necessary if pruning has not been done for some time, and trees have grown wild and dense.

Maintenance Pruning

Normal maintenance pruning is done mostly in the winter, after picking is finished. Your pruning instruction will tell you which of the pruning actions we described above you will need to use. If you are using all of them, the best order to do them in is to first cut windows, which will make is easier for you to see inside the tree canopy, then remove water shoots and deadwood in the tree canopy, then skirt the tree, and lastly remove the shoulders if there are any. Once you have done this, check the height of the tree. The farm manager will tell you how high he wants the trees to be. If the tree is still too high, pick one or two more branches and remove them too.

Another kind of maintenance pruning is summer pruning. Whenever you prune a citrus tree, the tree will respond over the next few weeks by growing a lot more twigs and leaves in the places where the cuts were made and where there is now enough sunlight inside the tree. This regrowth can sometimes be too much, and it can cause the canopy to become dense again, which will keep sunlight from getting into the tree canopy. For this reason you may be asked to remove some of the regrowth during the summer. Make sure that you know exactly what, where and how much to cut.

Corrective Pruning

The farm manager will give you very specific instructions for corrective pruning. If trees have been damaged you will usually be asked to remove the damaged part of the tree. The best way most of the time is to cut out branches as deep as possible, close to the place where they grew out of. If you are pruning trees that have grown wild, you may be asked to cut more windows, or to remove a lot more vegetation than usual. Follow these instructions carefully.

Pruning Procedures – Young Trees

Before citrus trees start bearing fruit, best practice is to prune very lightly, and more than once a year. Note that not all farms prune young trees, but if they do, the farm manager will give clear instructions on how he wants the young trees to be pruned, and it is very important that you follow these instructions.

Be especially careful with young trees not to prune too much. Usually you will prune the tree so that the canopy is balanced and in shape. You will also have a look at how the branches of the young tree are growing. The trunk should be straight and from it at most five or six branches should be growing at various heights, spaced around the tree. Also look out for branches that are twisted and crossed, and remove them. Where more than one branch is growing close together in the same direction, remove one. Lastly, make sure that no shoots are growing from the rootstock.

Equipment Use and Sterilisation

In the Pruning Equipment module we looked in detail at the steps you need to take to keep your equipment clean and in good working order. It is in your own interest to do this regularly – you will work faster and better, and there will be less chance of injuring yourself. If you are left-handed, ask you supervisor for left-handed pruning shears. The blades of left-handed shears are reversed. If you use right-handed shears with your left hand, you will not be able to see where you are cutting.

Pruning equipment must be sterilised after every row to make sure that they won't carry diseases from one tree to another. There are different ways to sterilise tools, but mostly the sterilisation solution is either sprayed on the tools, or the tools are dipped in it. Be sure to follow these instructions carefully.