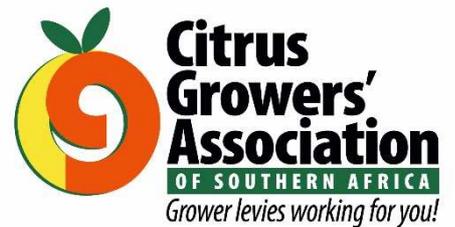
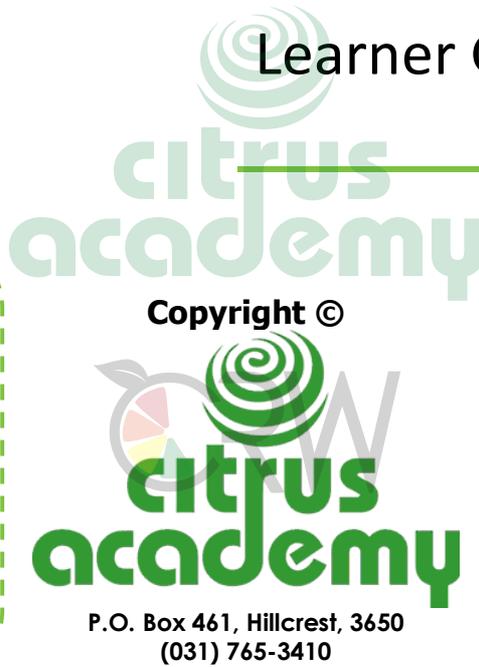

Citrus Harvesting

Module 1: Harvesting Supervision

Learner Guide



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Introduction

Harvesting citrus fruit is the critical step between producing good volumes of quality fruit, and packing those fruit in the packhouse. Picking teams have a big responsibility to maintain the quality of the fruit that has been produced and send it off to the packhouses in the best possible condition, with no injuries or bruises, as clean as possible, and with short, neatly clipped stems.

Supervising a picking team is an important job. Pickers are usually seasonal workers who get paid by the bag they pick, which means that they are incentivised to pick as fast as possible, and they can often forget to take care of the fruit they are picking. It is up to the supervisor to make sure that the pickers know what they need to do and what they are not supposed to do, and that they maintain standards and good picking practices throughout the day.

Before picking starts, you need to know where, what and how the team is going to pick, and what the weather conditions are likely to be so that you can assess the possible impact on picking. The supervisor must also make sure that the members of the picking team have the equipment they need, and that the equipment is clean, sanitary, and in good working order. While picking is taking place, you must check that the pickers are adhering to good picking practices, and that the fruit is not getting injured or damaged. The supervisor then needs to make sure that the fruit is transported to the packhouses in the right way.

Harvesting Instructions

The picking method that is to be used depends on whether you are picking fruit for export, juice or the local market. Picking export fruit means that pickers will use clippers to remove the fruit from the tree, and that special care must be taken to make sure that the fruit is not injured, damaged or contaminated. Good practices for export picking are described in detail in the Harvesting Practices module. Please make sure that you are familiar with this module.

It is also possible that you will be told to do selective picking. For instance, you can be told to only pick fruit of a certain colour according to the colour prints, or to selectively pick fruit above a certain size. In such cases, you must make sure that you are very clear on what is required, and that this information is communicated clearly to all the pickers – don't rely on word-of-mouth, talk to the whole team and explain exactly what needs to be done. If possible, show them pictures of exactly what you are looking for. You can even stick those pictures to the side of the picking trailer or bin while they are picking as a reminder.

The other picking method that can be used is snap picking. Remember that export fruit is not snap picked, because it is very easy to tear the fruit at the stem-end when it is snapped off the tree. Snap picking should only be used when the orchard is being stripped with all the fruit being destined for juicing or waste.

You need to be clear on whether pickers can pick low-hanging fruit from the trees. Fruit that grows so low on the tree that it is touching the ground or that water and mud splash up onto the fruit can be infected with *Phytophthora*, which causes brown rot, or *Galactomyces*, which causes sour rot. On some farms, the trees are sprayed in preparation for harvesting to control *Phytophthora*. This treatment has been found to be effective, but there is no treatment for sour rot.

Best practice is to prevent this problem by skirting trees, which is the practice of removing all the branches of a tree that hang below a certain height. Skirting is usually done during pruning, before the tree bears fruit. This ensures that fruit does not hang too low, and keeps the fruit away from the soil.

If these practices are done and the instructor gives the go-ahead, pickers can pick low-hanging fruit. If these treatments and practices were not applied, pickers must be instructed very clearly not to pick low-hanging fruit, or a separate team must be sent ahead to pick the undesirable fruit.

Picking Conditions

Citrus fruit must never be picked while the fruit is wet. The oil glands in the rind of the fruit become turgid and fragile when the fruit is wet, and in very cold, humid conditions. When the fruit is handled in these conditions, the oil glands in the rind rupture, causing oleocellosis. Fruit can therefore not be picked during or just after it rained, or in the early morning when there is dew on the fruit.

As a general guideline, harvesting should only take place when the temperature is between 13 and 30°C and the relative humidity is not higher than 70%. Lemons should also never be picked during, and for at least two days after, a cold front – especially if the cold front was accompanied by rain – because this leads to higher incidences of peteca.

Picking Teams

Pickers are usually seasonal workers that may or may not have done citrus picking before. A picker must be fit, and ready to work. Pickers are normally paid per bag, and they will therefore always try to pick as fast as possible. Because they want to pick quickly, there is the greater danger that they will cause damage and injuries to the fruit. It is the supervisor's job to check that this does not happen. Remember that injured or damaged fruit cannot be exported as it will rot very quickly.

You also need to make sure that pickers protect their own health and safety and that they are aware of the dangers that equipment might pose. You must also carry a first aid kit, and familiarise yourself with the standard operating procedures for emergencies for your farm, so that you can apply them without hesitation if an injury to one of the pickers in your team should occur.

Picking teams should be a manageable size. If the team is too big, it becomes too difficult for one supervisor to monitor, and the risk of injury and bad picking practices increases. If there are too many pickers, it will also be difficult for the pickers to get to the trailer or bins to empty their picking bags, and increasing the risk of fruit being damaged as the pickers crowd around the trailer.

It is your responsibility to look after the people in the picking team. There must be ablution facilities for them in the orchard and they must have access to drinking water.

Remember that a happy team is a productive team that cares about the fruit. At the start of every day, make sure that every picker has the equipment required. Also make sure that the pickers' nails are short and that they don't have any open injuries or sores – these must be covered with a blue plaster that can be easily seen if it falls off into the bin.

Picking Equipment

Picker Equipment and Protective Clothing

Each picker needs a picking bag, clippers, and a ladder if the trees are tall. Sometimes pickers also wear gloves, and sometimes even goggles. If there is a problem with any

of the equipment during picking, for instance if a bag or a pair of clippers should break, you need to repair or replace the item without slowing down the picking too much. Carry replacement equipment with the team, and also keep a toolbox to make basic repairs. All equipment used by pickers must be collected at the end of each day and stored safely and securely.

It is important to check that the picking bags used by your team are without any tears, rips or holes. Tears or holes must be fixed with thread and never with wire. Also check that the straps are sturdy and that they won't break when carrying a bag full of fruit.

Each picker must have a pair of clippers for picking export citrus. Check that your team's clippers are working well before handing them out to the pickers. Check that the springs are not worn out – the clippers must spring open by themselves after being shut – and that the finger loop is not loose. The blades should be sharp, and should meet up and not overlap, because if they do, the stems will be torn and not cut neatly. The clippers must also be clean and sterile before picking starts. It is best practice to clean and sterilise clippers as frequently as possible, because they are a main contributor to the spread of diseases in the orchard.

If the trees in the orchard are too tall for the pickers to reach the fruit at the top, they need ladders. Ladders can be made of wood or aluminium, and can have two or three legs. Make sure that the ladders are sturdy, free of splinters and burs, and that they are clean.

Best practice is for pickers to wear gloves while picking fruit, or even just one glove on the hand holding the fruit, as this protects the fruit from injuries caused by nails. When picking lemons, gloves also protect the pickers' hands from the thorns on the tree. However, some growers choose not to use gloves because they collect dirt and can easily become wet. If gloves are used, make sure that they are in good repair and dry at all times. Remember, gloves must be removed during breaks and if the picker needs to go to the bathroom.

One of the most common picking injuries is eye injuries from twigs and small branches. Pickers are also prone to getting dirt and dust in their eyes, especially if they are picking fruit above their heads and looking up. Best practice is to issue each picker with a pair of goggles to protect their eyes.

It is a good practice to issue pickers with overalls and gumboots. This helps to protect them from injuries from branches and thorns, and helps on stony ground.

Picking Containers

In the orchard, fruit is placed in either picking trailers or bulk bins. Picking trailers are normally attached to a tractor, and have a capacity of 2 to 3 tons. Trailers are normally serviced before the picking season starts to make sure that they are in good working order.

Bulk bins are made of plastic and have a capacity of 350 to 400 kilograms. They are usually transported on low-bed trailers behind tractors, but can also be transported on the back of flat-bed trucks. Before using them, check that bins are whole, clean and dry. Watch out for any broken pieces that stick out and could injure the fruit.

Picking Practices

Picking trailers or trailers with bulk bins must be parked in the orchard where the pickers do not have to walk too far to empty their bags – they may be tempted to run, and this must be

avoided. Best practice is that pickers should never be picking more than one row away on either side of the trailer or bin.

In some cases, bins are put out in the orchard between rows so that the pickers have an even shorter distance to walk before emptying their bags. From there they are collected by specialised trailers pulled by tractors. Best practice is that bins should never be placed directly on the ground, as they will pick up dirt, mud and fungal spores. The dirt can damage fruit when the bins are stacked. The dirt and fungal spores will also be carried to the packhouse and compromise the sanitation processes there. Good practice is to place bins on sheeting to minimise contamination by mud or soil.

While the fruit is being picked, check for the following:

- ❖ Fruit is placed, not dropped, into bags
- ❖ Fruit that is on the ground or falls to the ground is not picked up
- ❖ Low-hanging fruit is not picked if not allowed
- ❖ Visibly damaged, injured or rotten fruit is not picked
- ❖ Pickers are not running with bags containing fruit
- ❖ Bags are emptied gently into the bin or trailer
- ❖ There are no long stems on the fruit

Check the fruit that pickers are tipping into the bins or trailer. If there is rotten or damaged fruit, or fruit with long stems, alert them to this. If they don't improve, you can refuse to count the bags that are not up to standard, so that they won't get paid for it. This is a harsh measure, but it will force the pickers to be more careful.

On some farms, some pre-sorting is already done in the orchard while picking. Pre-sorters check fruit in the bins right there, and they clip long stems, remove and discard decayed and damaged fruit, and move fruit that is clearly not fit for export or the local market to juice bins. This would usually include very green fruit, and over- and under-sized fruit. Pre-sorters must be very clear on what fruit they need to remove. This practice takes pressure off the packhouse, and means that it has to deal with less fruit that is unsuitable for export. It also reduces the chance of decayed fruit entering the packhouse, reducing the contamination risk.

Be careful not to overfill picking trailers and bins, because this will damage the fruit. If the fruit is particularly vulnerable to pressure injury, as is the case with certain citrus types and in certain weather conditions, picking trailers should only be filled halfway, and bulk bins should be filled to two hand-widths from the top.

Quality Control

You as the supervisor are responsible for the quality of the work your team does. If the fruit picked by your team has long stems, and a lot of damage and injuries, you will be held accountable. Constantly monitoring picking practices and checking fruit in the bins is a good start to improve the picking standards of your team.

The following method is a quick and effective way to accurately assess how many fruit injuries, which are not visible to the naked eye, are occurring. Fill a string bag with a sample of fruit from a bin or trailer. In a large bucket, mix 5 grams of indigo carmine, a blue dye, with 10 litres of water. Place the string bag with the fruit into the bucket, and leave it for 5 minutes. When you take the fruit out, you can observe injuries to the fruit. This practice does not damage the fruit – uninjured fruit can be replaced in the bins and sent to the

packhouse. If you find that there are too many injuries to the fruit, immediately speak to the pickers and instruct them to be more careful.

Transport to Packhouse

Once the bins or picking trailers are full, the fruit is transported to the packhouse. If bins are transported on a truck, they are stacked two to three high. Here it is especially important that the bins are not overfilled; if they are, there will be pressure on the fruit in the bin below. Fruit should be transported to the packhouse as soon as possible after being picked.

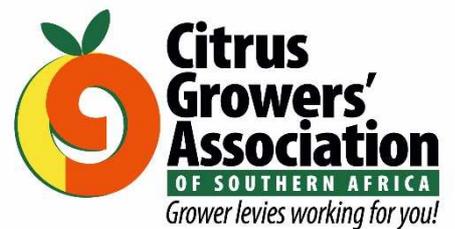
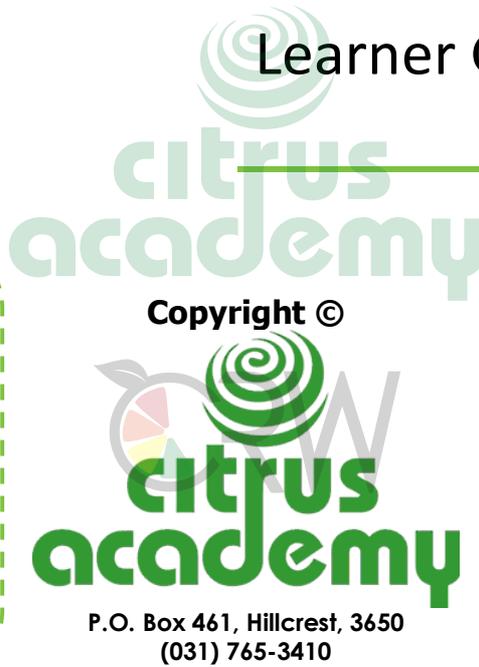
Take care during transport that the fruit is not unnecessarily bounced around in the bin or trailer. It is important that farm roads are repaired before the picking season and the pressure of the trailer tyres is adjusted, to ensure as smooth a ride as possible for the fruit. The tractor must not drive too fast on dirt roads, again to protect the fruit against damage, and to limit the amount of dust getting onto the fruit.



Citrus Harvesting

Module 2: Harvesting Practices

Learner Guide



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Introduction

Citrus fruit is generally picked for export from March to October, although picking can start as early as mid-January, depending on the type of citrus and the production region. On most citrus farms, seasonal workers are employed to pick fruit. It is very important that pickers know what to do and what not to do while picking export fruit.

While picking citrus, you must remember that you are working with fresh fruit that can be injured and damaged. The most injury and damage to citrus fruit happen during picking. Once fruit is injured or damaged, it cannot be exported and will have to be sold for less money, or if it rots, it cannot be sold at all and will instead cost money to remove. Remember that you are picking your wages off the tree.

Picking Supervisor

While you are picking, there will be a supervisor or team leader for your picking team. This supervisor will tell you what sort of picking you will be doing and what you should be picking. Most of the time you will be picking fruit that will be exported using clippers. But sometimes you may be told to pick only fruit that has a certain colour or size, or that looks a certain way, and leave the rest of the fruit on the tree. You must listen carefully to these instructions, and follow them.

The other kind of picking is when the export fruit is already off the trees, and the fruit that is left is going to the juice factory. In that case, you may be told not to use clippers, but just to pick the fruit with your hand. This is called snap picking.

In this video, we will look at how export citrus fruit must be picked. You must follow all these steps very carefully to protect the fruit, and to make sure that the fruit arrives at the packhouse in a good condition.

Personal Hygiene

Before you start picking, you need to make sure that your hands are clean and your nails are short, because long nails can injure the fruit. You should also not be handling the fruit if you have any open injuries or sores. They must be covered with a blue plaster before you begin.

Picking Equipment

You will be issued with a pair of clippers that you will use to pick the fruit. Clippers are made of steel and the blades have rounded tips so that it will not injure the fruit. A spring keeps the clippers open, and the finger loop helps you to control the clippers while picking. The blades of the clippers should not overlap. If they do, they may tear the stem, and a long stem will damage other fruit. If your clippers do not work properly or are not sharp enough, report it to your supervisor immediately.

You will also receive a picking bag into which you place the fruit as you pick it. Some picking bags only have an opening at the top, while others open at the bottom with quick-release catches. The picking bag is always slung over the shoulder opposite to the hand holding the clippers. This means that if you are right-handed and have the clippers in your right hand, the bag should be over your left shoulder. Make sure that the bag does not have any holes or tears in it and that the strap is sturdy. If the bag is torn or ripped, repair it using thread.

Also check that the bag is clean, dry and completely empty before you start. Twigs or dirt in the bag will damage the fruit.

When picking tall trees, you will use a ladder to get to the fruit high up in the tree. Ladders can be made from aluminium or wood, and must be strong and sturdy. Ladders can have two or three legs. Check that your ladder does not have any splinters or loose metal pieces that can injure you, or damage the tree or the fruit.

You may be asked to wear gloves while picking, to protect the fruit from injury and to protect your hands, especially if you are picking thorny trees. Make sure that your gloves fit properly, and that they are clean and dry. You may also be issued with a pair of goggles to protect your eyes against twigs and small branches, and against dirt falling into your eyes when you are picking high up.

If you are issued with a set of overalls and gum boots, you are responsible for keeping them neat and clean.

Picking Practices

Now we get to how the fruit must be picked. Hold the clippers in your dominant hand – the right hand for most people – and take the fruit in your other hand. Put the blades of the clipper on the fruit, and cut the stem as close as possible to the fruit without cutting or tearing the fruit itself. Only a short piece of stem must be left on the fruit. Cut the fruit stem at a right angle to the fruit. If you cut the stem skew it may leave a sharp point that can damage other fruit. Be careful not to damage the fruit with the tip of your clippers – this is the cause of most picking injuries.

Place the fruit in the bag. Don't throw or drop it in the bag, you will bruise the fruit. If the stem of the fruit is too long, clip it off before putting the fruit in the picking bag. Remember that any long stem will injure the other fruit in the bag.

If the tree is too tall to reach the fruit at the top, all the fruit that can be reached from the ground must first be picked before using a ladder, so that the ladder will not press against and injure fruit still on the tree. If you are using a ladder with two legs, lean it against the tree. Make sure that it is sturdy and secure before climbing it. If the ladder has three legs, the third leg is placed under the canopy of the tree to prop up the ladder, so that it does not have to lean against the tree. Be careful not to bump your picking bag against the ladder if the bag already has fruit in it.

When picking, make sure that you only put good quality fruit in your bag. If fruit is already injured, split, damaged or rotten on the tree, do not pick it. If fruit is lying on the ground or falls off the tree by itself, or if you drop any fruit on the ground, do not pick it up, ever. The fruit might look good now, but it will rot at the packhouse. Fruit that has dropped on the ground must stay there.

If you pick fruit with injuries, rot, mud, thorns or long stems and try to tip it into the bin, the supervisor may not count that bag and you will not get paid for it. For your own benefit, only pick fruit that is healthy and whole.

Fruit that hangs low on the tree can be picked, but make sure first from your supervisor whether this is allowed. Fruit that touches the ground must never be picked nor placed with other export fruit.

Once your picking bag is full, take it to the picking trailer or bin to tip it. Never run with a picking bag that has fruit in it. This will make the fruit bounce against each other, and cause injuries.

If your bag only opens at the top, take the bag off your shoulder, lay it down on the fruit in the bin and lift the bag to let the fruit roll out. If your bag opens at the bottom, keep the bag over your shoulder, rest it on the fruit in the bin, release the catches and lift the bag away, allowing the fruit to roll out the bottom. Do not throw the fruit into the bin or drop it onto other fruit, because this will bruise the fruit. Once all the fruit is out of the bag, shake out all the leaves and stems that may still be in the bag before putting fruit into it again.

At the End of the Day

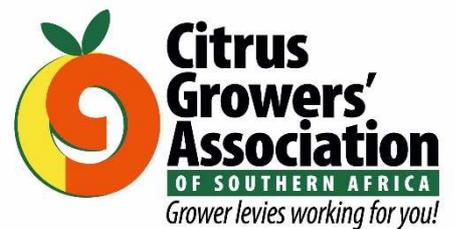
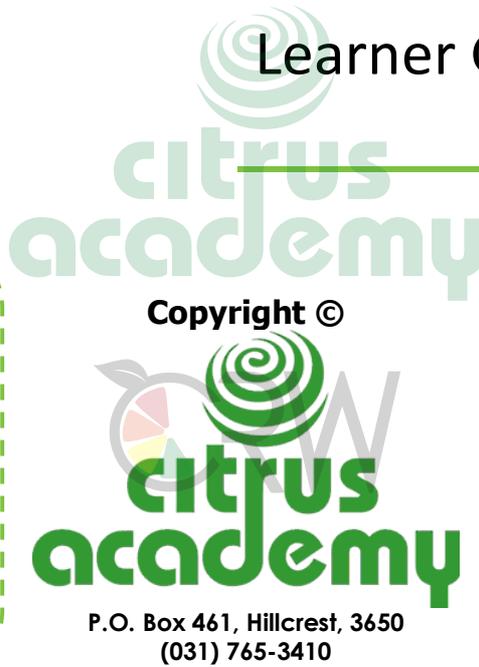
After you finish picking for the day, hand your equipment back to the supervisor, who will lock it away safely, ready for the next day. The supervisor will instruct you on how and when to clean and sanitise the equipment.



Citrus Harvesting

Module 3: Orchard Sanitation

Learner Guide



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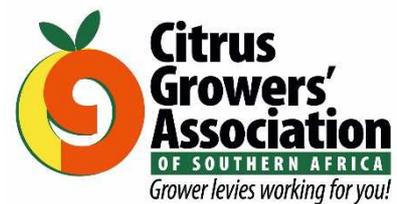
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Introduction

A packhouse is not a hospital for sick fruit. Nothing can be done in the packhouse to repair damaged, injured or sick fruit coming from the orchard. Regular orchard sanitation and good picking practices are very important to protect the fruit and keep them healthy. Always remember that fruit is a perishable product.

Postharvest Diseases

There are many different pathogens that we must prevent from contaminating fruit in the orchard. Remember that the word 'pathogen' is used for anything that can cause a disease, such as viruses, bacteria, and fungi. Most of the pathogens which cause citrus diseases, are fungi. They spread through vast numbers of invisibly small spores, and it is these spores that we must prevent from getting into our fruit.

The most important pathogens to protect against are those that get into the fruit through a wound on the fruit. This can be avoided by making sure that fruit is not injured or damaged during picking so that pathogens cannot get in. This is also why it is important that injured fruit is not put with the other fruit, because they may be carrying these pathogens to the packhouse.

There are also latent pathogens. The word 'latent' means something that is there, but not active, and waiting for the right conditions to attack. Latent pathogens live on deadwood in the trees. When it rains, fungal spores are washed down from the deadwood onto the fruit rind or into the button, where the spores lie dormant until the conditions are ideal for infection to start. Fungal spores grow best in warm and humid conditions and out of direct sunlight. In the packhouse, and especially in de-greening rooms, the conditions are ideal for these pathogens to develop.

We must also remember that there are pathogens that live in the soil. If they get a chance to get onto the fruit, they will infect the fruit and start to spread, producing more and more spores. Fruit fall on the ground for different reasons. They may have fallen off the tree after being stung by a pest insect, or they may have dropped on the ground during picking. Fruit that hangs low and close to the ground can also get soil pathogens on them. When it rains, water can splash up onto the fruit, carrying the pathogens with it. It is even possible that, when there are high numbers of flying insects in combination with rotten fruit, the insects can carry spores from fallen fruit on the ground to fruit still hanging in the tree.

Orchard Sanitation Practices

We can now start to see what we must do to keep our fruit safe and healthy.

Pruning Practices: Deadwood and Skirting

Firstly, now that we know latent pathogens live on deadwood in the trees, we can remove the deadwood so that they have nowhere to live. Secondly, by skirting the trees we can make sure that there are no branches that can carry fruit that will hang so low that pathogens that live in the soil can get onto the fruit and into the tree. In the Citrus Academy's audio-visual module on citrus pruning practices, we look at best practices for removing deadwood and skirting trees in great detail. Please watch this module.

Removing Out-of-Season and Fallen Fruit

In the third place, no fruit that has fallen on the ground in the orchard must ever be picked up and placed with other export fruit, because it has soil pathogens on it.

And lastly, we must make very sure that we remove all the waste fruit lying on the orchard floor often, so that the pathogens cannot propagate and multiply in this fruit. Also remember that pest insects, like false codling moth and fruit fly, lay their eggs in fruit. If rotten fruit is allowed to stay in the orchard, the eggs will hatch in the fruit and the larvae will grow. By leaving the rotten fruit in the orchard you also allow the pest insect to stay there, ready to attack more fruit.

All fruit lying on the orchard floor must be picked up and taken out of the orchard. A stick or scoop can be used to pick up the fruit and place it in a bag. This must be done once a week throughout the year, and at least twice a week from after colour break until picking in the orchard is finished. While the fruit in an orchard is being picked, it is best to have an orchard sanitation team following right behind the picking team to immediately pick up and remove all the fruit that might have dropped to the ground during picking.

Fruit that ripens late in the season is not as healthy and vigorous as earlier fruit, and it is risky to export such fruit. This fruit is sometimes stripped off the trees, and also treated as waste fruit. After picking, all fruit must be stripped from trees, even hard, dry fruit. If left on the trees until the next season, this fruit can be infected with pathogens, later spreading and infecting more fruit.

It is important to remove out-of-season fruit throughout the year, starting just after physiological fruit drop in November, when the fruitlets are still only the size of marbles. Out of season fruit is fruit that ripens at a different time from the other fruit. They can carry pest insects and pathogens from one season to the next.

Disposing of Waste Fruit

All the waste, late-season, and out-of-season fruit must be destroyed in such a way that the pathogens can no longer infect any other fruit. In dry climates, the fruit can be finely chopped up and spread out to dry in the sun outside the orchard. In more humid climates the pathogens can still develop in the chopped up fruit, and so best practice is to bury the waste fruit at least 30cm deep, and at least 400 meters away from the orchard. Fruit can also be collected and used as animal feed, for cattle, pigs or game.