HARVESTTOHOME

The fresh fruit trade chain

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fpef fresh produce EXPORTERS' FORUM SOUTH AFRICA

FRESH FRUIT EXPORT VALUE CHAIN TRAINING MANUAL

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Foreword

The South African fresh produce export sector plays a vital role in both the national economy and global food supply chains. It is a dynamic, high-stakes environment that demands professionalism, agility and a solid understanding of the intricate systems that move fruit from orchard to overseas consumer. This handbook has been developed with junior and middle management in mind - those who are building their careers in this fast-paced and often unpredictable industry.

At the heart of fruit exports lies the trade chain - the journey fruit takes from the farm, through multiple hands and processes, to its final destination in global markets. Along this route, each link in the chain carries specific responsibilities and risks. Exporters and service providers must navigate evolving standards in areas such as quality assurance, food safety, environmental and social responsibility and regulatory compliance, all while managing the unique challenges posed by a highly perishable product and a logistics system vulnerable to delays and disruption.

This handbook offers a practical and comprehensive introduction to the key components, activities and decision points within the trade chain. By equipping professionals with the knowledge to understand how their role fits into the bigger picture, we aim to promote greater operational efficiency, risk awareness and accountability throughout the sector.

Success in fruit exports is never accidental - it is earned through knowledge, diligence and attention to detail. Whether you are working in logistics, marketing, quality control, or grower support, this book is designed to help you strengthen your understanding and grow your contribution to this demanding but rewarding field.

It is our joy to make this book freely available to the South African fresh produce export sector in pdf format. We trust that the insights shared here will support your journey toward professional growth and excellence in the fresh produce export industry.

Piet de Jager
Chief Executive Officer, FPEF
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Editorial team

This edition has been thoroughly revised and significantly expanded by Johannes Brand (Transformation Manager at FPEF and Agribusiness Consultant). Special thanks also go to Andy Connell (Logistics Consultant), who played a key role in updating and expanding Chapters 8, 9 and 10, which focus on logistics.

We extend our sincere appreciation to our sister organisations - CGA, Hortgro, SATI, Subtrop and BerriesZA - for their valuable contributions to this updated edition.

Contents

CHAPTER ONE

The South African fresh fruit export industry - then and now

1. A brief history of the fresh fruit export industry

People started growing fruit in South Africa soon after the Dutch settlers arrived in South Africa in 1652. The Dutch settlers first planted fruit trees in the Cape to provide fresh fruit for sailors arriving on vessels on their way to and from the East.

In those days the perilous journey from Europe by sea took a year or more. With the Cape becoming a permanent station, vessels were able to stock up on meat, fruit, vegetables and water. The first orange trees were planted in 1654. This was an important source of vitamin C for the sailors and prevented scurvy.

Over the next 200 years, orchards and vineyards were established around the country and their harvests were sold locally. But the local market was too small and by the 1850s it became clear that the industry would only survive if it could export its fruit.

Percy Molteno

The first breakthrough came in 1892. In that year, Percy Molteno, son of the Cape's first prime minister, successfully exported the first small consignment of peaches under refrigerated conditions to the United Kingdom (UK). The fruit was carried aboard a vessel named the Drummond Castle, and was sold for a high price at London's Covent Garden market. This encouraged others to look more closely at opportunities in the fresh fruit export market. Fruit and vine cultivars were imported, to improve the local stock and soon fruit trees and vines were being grown all over the Western Cape, providing fruit for export.

Rapid new **developments in refrigeration** later made it possible to transport a range of fruit types by vessel to overseas markets although this did not come without its problems. This played a significant role in expanding the fresh fruit industry.

The Drummond Castle, carried the first successful consignment of refrigerated Cape fruit to London.

In the early 20th century, fruit was shipped using conventional cargo vessels with rudimentary refrigeration, making long-distance transport challenging. The introduction of refrigerated ships, or "reefer" vessels, in the mid-20th century significantly improved the export process. These vessels allowed fruit to be stored in refrigerated holds at controlled temperatures, reducing spoilage and maintaining product condition during transit. For many decades, most South African fruit was exported in **specialised reefer vessels**, and their use continues to some extent to this day.

The **porthole container** was an early type of refrigerated shipping container developed in the 1960s to transport perishable goods. Unlike modern integral reefer containers, the 6m porthole containers relied on an external refrigeration system provided by the ship or terminal. These containers featured two "portholes" – an inlet and outlet hole at the front of the container – that allowed cold air to be circulated through the container. Porthole containers were introduced in South Africa in the early 1970s and were phased out between 2000 – 2005 with the introduction of modern 12m integral reefer containers.

The **integral reefer container** was developed in the late 1960s and early 1970s, revolutionising the transportation of perishable goods. Unlike earlier porthole containers, which relied on external refrigeration systems, integral reefer containers have built-in refrigeration units, allowing them to maintain precise temperature control independently throughout the supply chain. The introduction of these self-contained refrigerated containers provided greater flexibility, as they could be transported on standard container ships, trucks and trains. This advancement was driven by the rapid growth of containerised shipping, pioneered by companies like SeaLand and Maersk enabled by standardisation of shipping containers. The intermodal 12m integral reefer container allowed "door to door" conveyance, eliminating many pallet handling moves and cold chain interruptions, as well as enhancing cargo security.

Initially the adoption of integral reefer containers in South Africa was slow due to ships servicing South Africa being equipped to carry porthole containers but their adoption picked up quickly in the early 2000s and the use of porthole containers in South Africa was discontinued. At this point the bulk of fruit was still being carried by specialised reefer vessels, but the use of integral reefer containers gradually increased to become the dominant mode of shipping fruit from South Africa.

Before 1997, South Africa had a legislated **single channel marketing system** under which all fruit exports (except for subtropical fruit) were managed by two boards, the Deciduous Fruit Board and the Citrus Board. These boards appointed Unifruco Limited for deciduous fruit and Outspan Limited for citrus to act as their sole export agents. The subtropical fruit industry only exported very small quantities, so its marketing was less controlled.

In October 1997, the law regarding exports and agents was changed to allow for other exporters or agents to operate in the fresh fruit export industry. This was referred to as the deregulation of the fresh fruit industry. Unifruco and Outspan merged to form Capespan, which was joined by hundreds of other export companies. By 2007, there were 375 export companies registered with the PPECB.

Since 1997, fruit export volumes have grown in part as a result of this change in the law. This has also encouraged the industry to expand its markets so that South Africa now exports fruit to new markets across the globe.

2. The fresh fruit industry today

South Africa has become one of the biggest producers and exporters of fruit in the southern hemisphere. The southern hemisphere's fruit production season is counter seasonal to the northern hemisphere, enabling the southern hemisphere to supply fruit to the northern hemisphere during its off season.

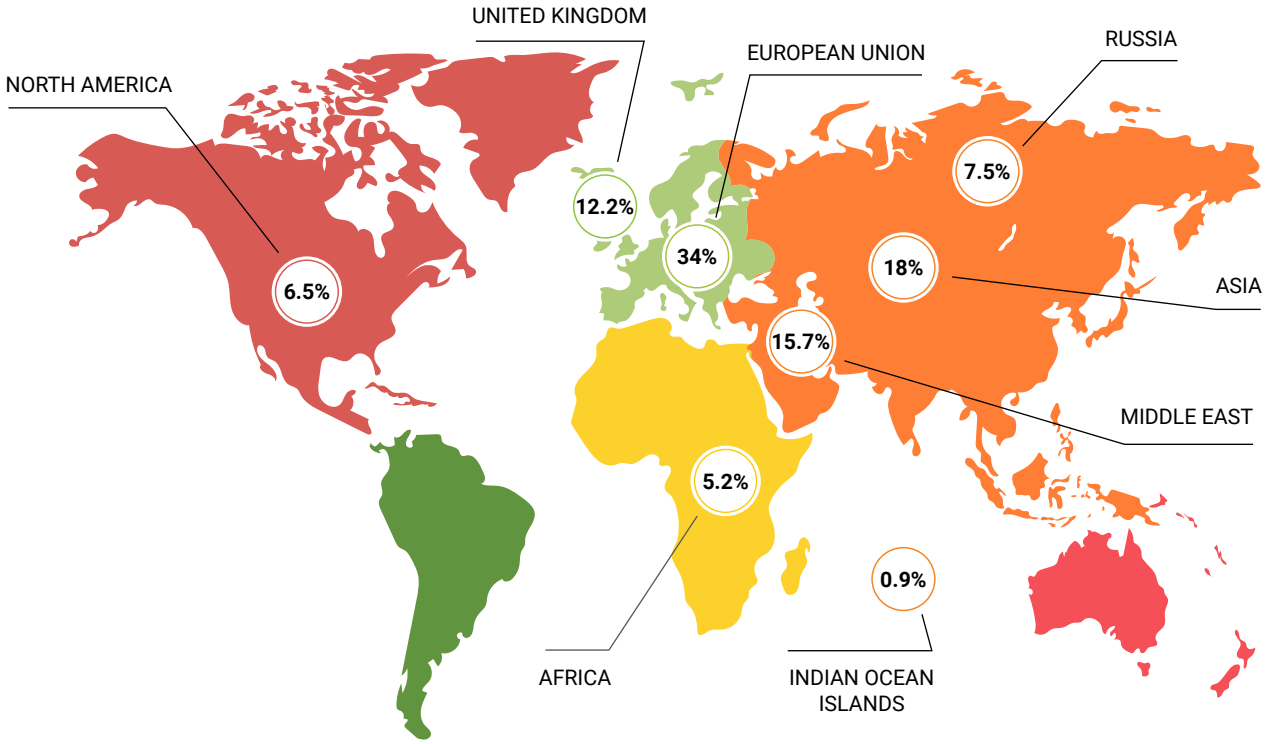
Approximately 90% of the world's population lives in the northern hemisphere, providing southern hemisphere fruit exporters with excellent market opportunities. This is because the majority of the earth's landmass, including highly populated regions such as North America, Europe and Asia are located north of the equator.

Alongside South Africa, other key fruit exporters in the southern hemisphere with overlapping fruit production seasons include Chile, Peru, Brazil, Argentina and Australia.

Approximately 60% of all fruit produced in South Africa is exported to overseas markets, although this varies according to different types of fruit. South Africa's fruit industry is therefore predominantly export focused.

South Africa has been able to develop its markets so that it now exports to over 100 countries around the world. The map below shows the different continents to which South Africa exports its fresh fruit. The income from these exports is more than R60 billion, which makes it a very valuable contributor to South Africa's economy and the fruit industry employs around 460,000 people.

SOUTH AFRICAN EXPORT MARKETS 2023/24 SEASON

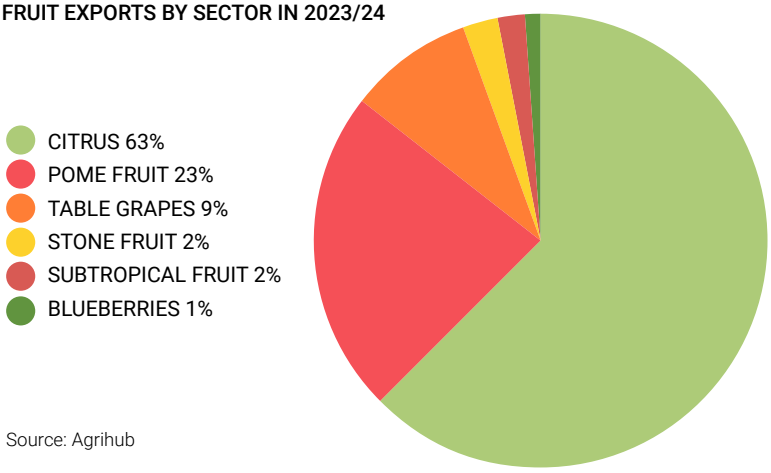


Source: Fresh Fruit Trade 2025

Export by sector

The sector that exports the largest volumes of fruit is citrus, followed by pome fruit (apples & pears), grapes, stone fruit (nectarines, plums, peaches, apricots and cherries), subtropical fruit (avocados, mangoes and litchis) and blueberries.

FRUIT EXPORTS BY SECTOR IN 2023/24



Source: Agrihub

3. Fruit commodity overview

Fruit is produced in most of the provinces in South Africa as illustrated below.

MAP OF FRUIT REGIONS IN SOUTH AFRICA

Source: FPEF

3.1. The fresh fruit production calendar

The South African fresh fruit export industry is divided into three major fruit categories:

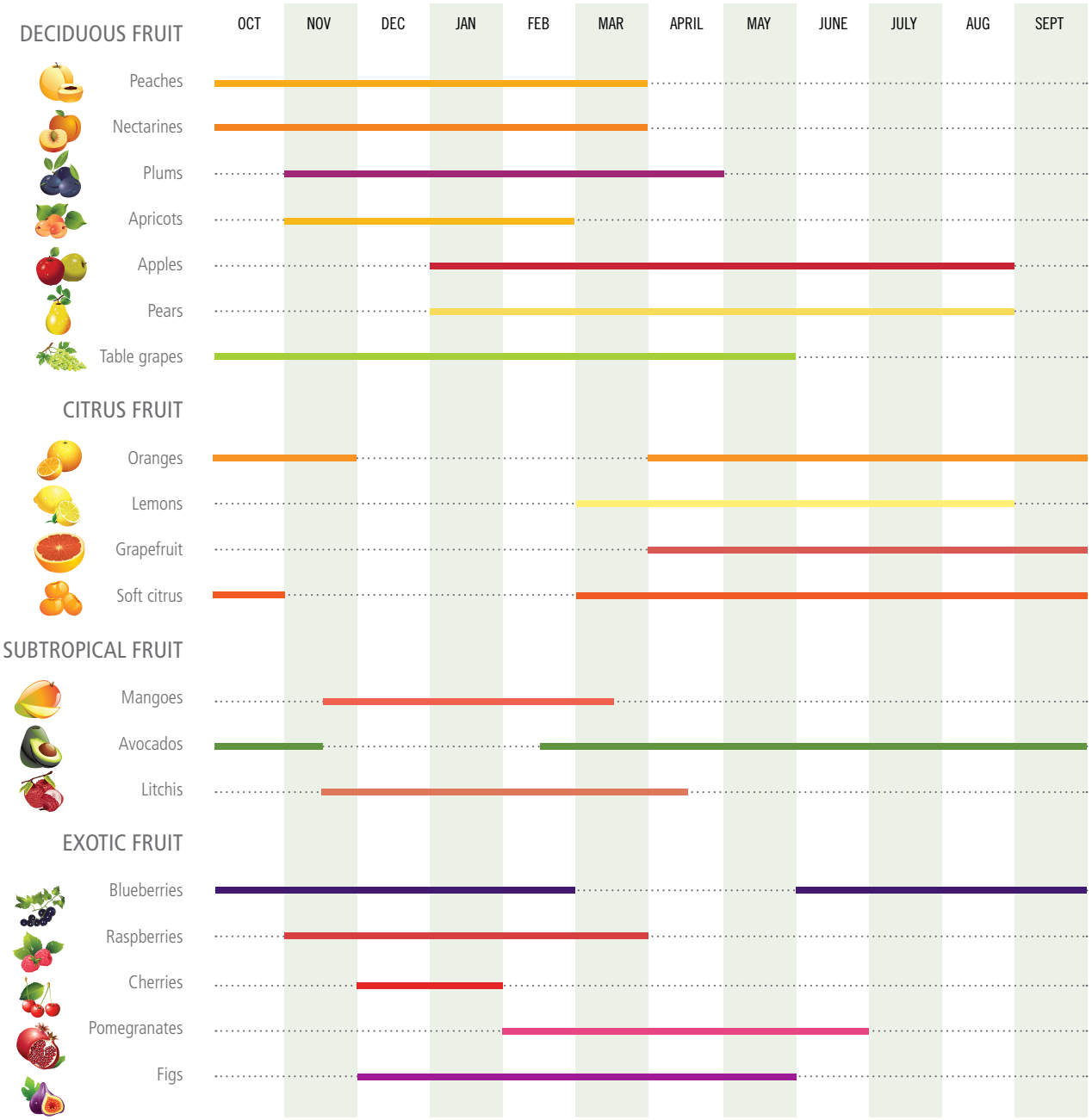
- Citrus - oranges, soft citrus, lemons and grapefruit
- Deciduous - pome fruit, stone fruit and table grapes
- Subtropical - avocados, mangos and litchis

The word deciduous describes a plant that loses all its leaves each year in autumn and remains dormant during the winter.

In addition to the above major fruit categories, there are several upcoming and exotic fruit types produced for export with blueberries rapidly gaining prominence. Other examples of exotics include pomegranates, figs and raspberries.

South Africa's fruit export calendar covers twelve months of the year as illustrated below.

THE FRESH FRUIT EXPORT CALENDAR



Source: FPEF

3.2. Citrus fruit

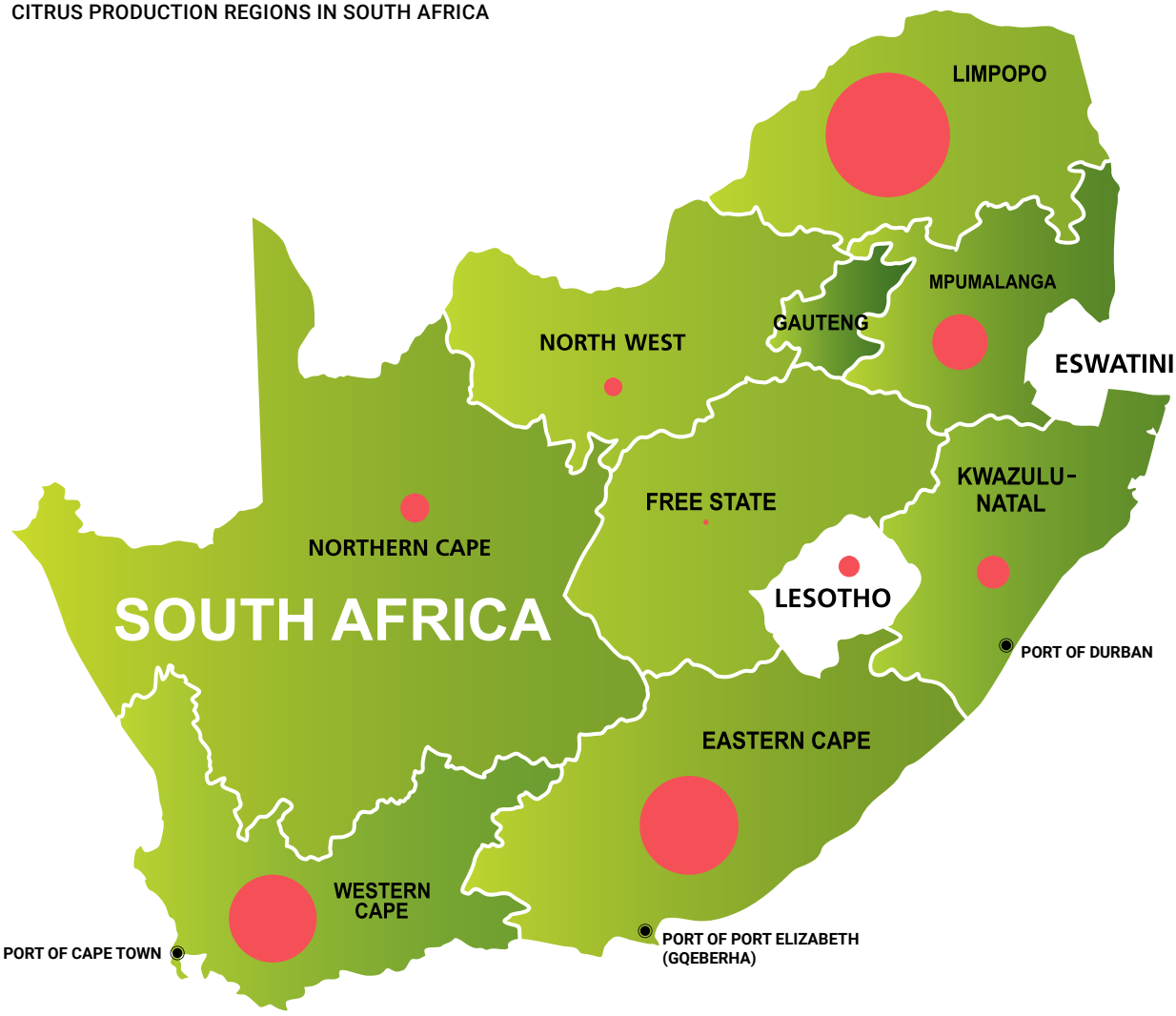
Citrus overview

South Africa is the second largest exporter of citrus in the world after Spain and is the biggest citrus exporter in the southern hemisphere. There are over 1,400 citrus farmers in South Africa employing an estimated 100,000 people on farms, and a further 40,000 in packhouses and downstream activities. Citrus is produced for export from March to October.

Where is citrus grown in South Africa?

Citrus is grown in all over South Africa. The three biggest citrus production regions are the Limpopo province, followed by the Eastern Cape and Western Cape.

CITRUS PRODUCTION REGIONS IN SOUTH AFRICA



Source: CGA 2024 Industry Statistics

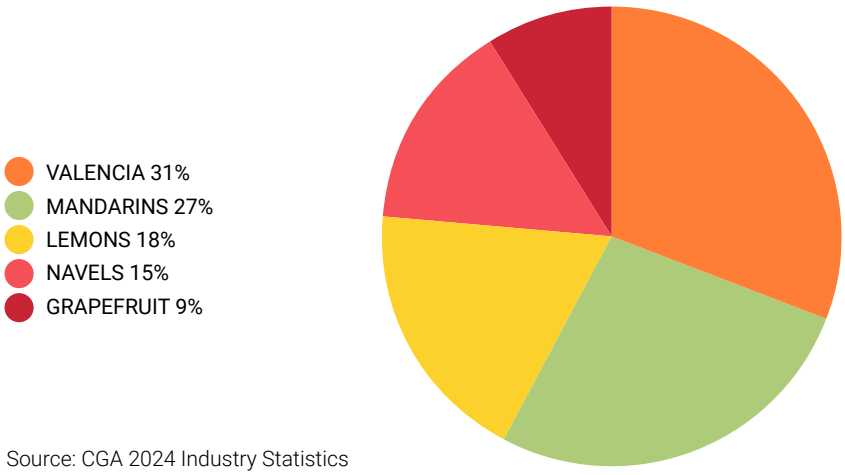
Citrus production is expanding rapidly in South Africa and the Citrus Growers Association has indicated that a volume of 260 million cartons is possible by 2032 (South Africa exported 165 million cartons in 2024).

Types of citrus

There are four main types of citrus grown in South Africa:

- Oranges (Valencias and Navels)
- Soft citrus (also referred to as mandarins or easy peelers)
- Lemons
- Grapefruit

PERCENTAGE BREAKDOWN OF CITRUS TYPES



Source: CGA 2024 Industry Statistics

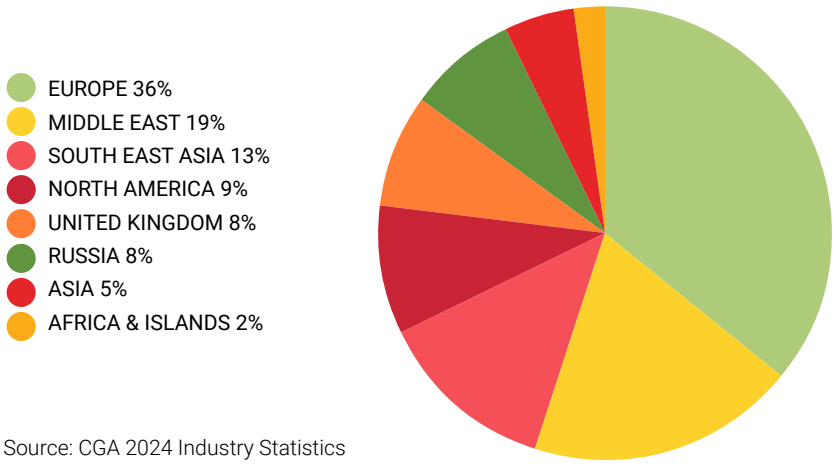
Prominent orange varieties include Midnight Valencia, Valencia late, Delta Valencia, Cambria Navel and Palmer Navel. Prominent soft citrus varieties include Nadorcott, Tango, Nova and Nules Clementines. By far the most common lemon variety is Eureka, however, some new seedless lemon varieties were recently introduced. The two most prominent grapefruit varieties are Star Ruby and Marsh.

Citrus exports

Europe is South Africa's biggest citrus export destination, followed by the Middle East and Southeast Asia (refer to figure below).

In the southern hemisphere, South Africa competes with Argentina, Chile and Australia in citrus production during the main part of their season.
Towards the end of the marketing season, South African citrus starts to overlap in export markets with citrus grown by countries in the northern hemisphere like Israel, Spain, Egypt, Morocco and the USA.

CITRUS EXPORTS PER MARKET SEGMENT



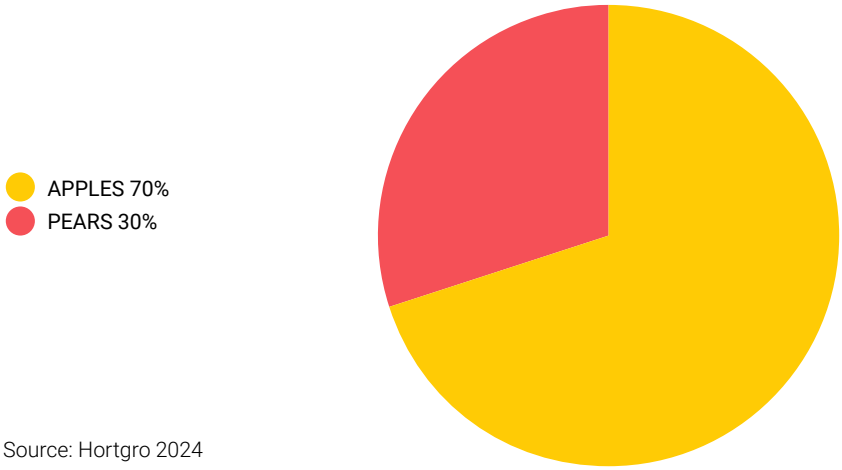
Source: CGA 2024 Industry Statistics

3.3 Pome fruit

Pome fruit overview

The pome fruit sector in South Africa is mainly comprised of apples and pears with apples making up about 70% of the volume in the sector as illustrated below. There are 613 pome fruit growers in South Africa employing around 48,000 workers. South Africa is the biggest apple exporter in the southern hemisphere, followed by Chile.

PERCENTAGE BREAKDOWN OF POME FRUIT TYPES



Source: Hortgro 2024

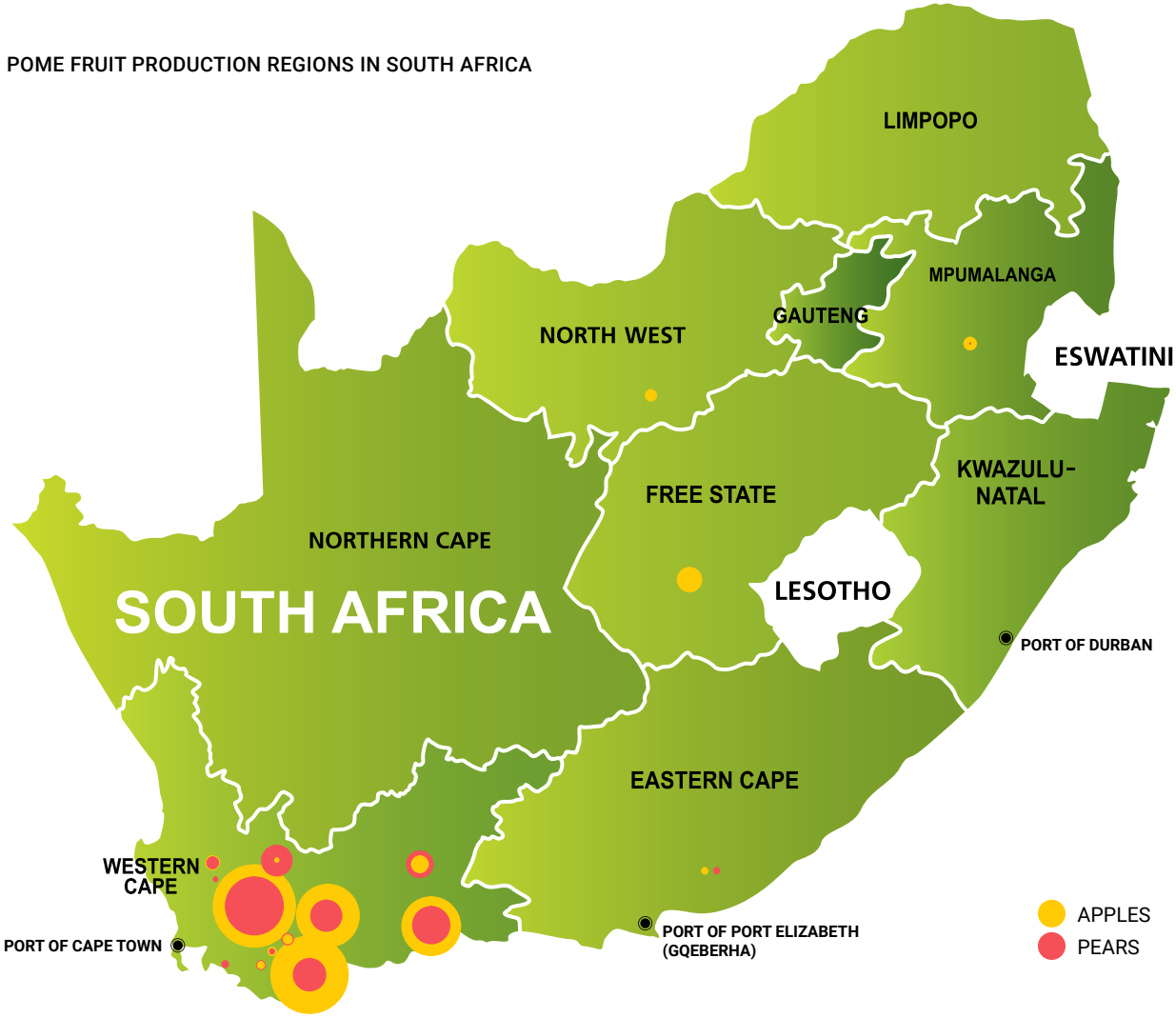
When is pome fruit harvested?

Pome fruit harvesting commences in January and runs through to June. However, apples and pears can be stored for many months in controlled atmosphere (CA) cold storage and the export season therefore extends throughout the whole year (although export volumes are lower in the latter half of the year).

Where is pome fruit grown in South Africa?

Most apple and pear export varieties in South Africa have a high winter chilling requirement, which means that they can only be grown in areas with cold nights and cool days during the winter. The main pome fruit growing areas are therefore situated in the Western Cape, the Langkloof valley in the Eastern Cape and in the eastern Free State highlands.

POME FRUIT PRODUCTION REGIONS IN SOUTH AFRICA



Source: Hortgro Key Deciduous Statistics 2024

Apple varieties

Apples can be divided into three main categories according to colour; bi-colour, green and red. Golden delicious can also be categorised as yellow. Bi-colour apples such as Braeburn, have mixed colours with red and yellow or green hues often creating a stripy pattern or a red or pink blush as with Crips red or Pink Lady. Some varieties such as Gala and Fuji are sweeter while others like Pink Lady have a tart undertone. Bi-colour and red apples are currently popular with Gala varieties topping the export charts and newer red varieties such as Cripps Red and Big Bucks are rising in prominence. Pink Lady remains popular in many export markets, while the classic green varieties, Granny Smith and Golden Delicious (green/yellow) are still exported in large volumes to select markets with Africa being a key market. South African apples tend to be smaller than apples grown in the northern hemisphere with a higher sugar content.

Gala

Granny Smith

Braeburn

Pear varieties

Popular pear varieties grown in South Africa can be categorised as green, such as Williams Bon Chretien or Packhams Triumph, or blush pears with a pink or red blush such as Forelle or the newer Rosmary, Cheeky and Celina varieties.

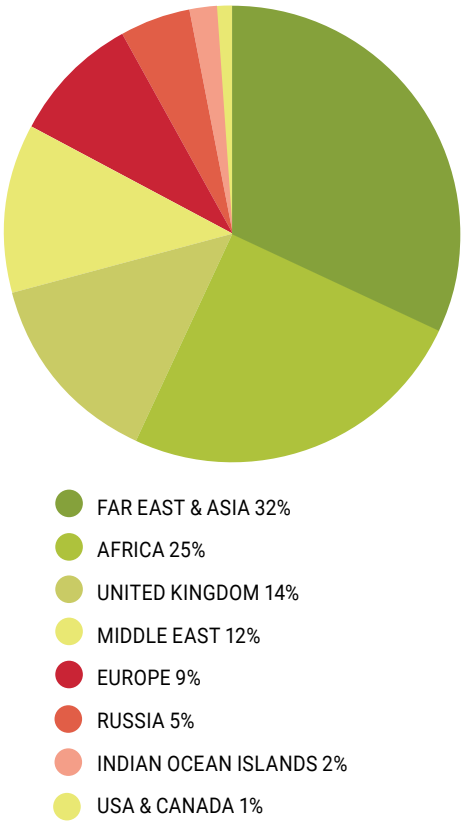
Packhams Triumph

Forelle

Apple and Pear Exports

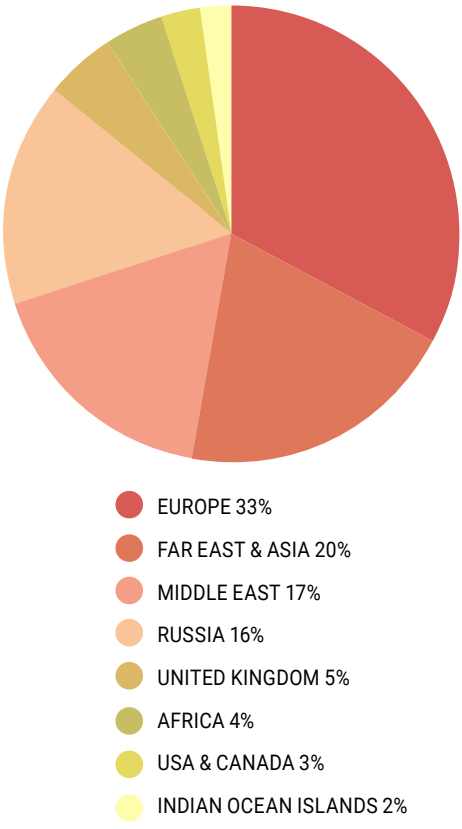
The main apple export markets are the Far East and Asia, Africa and the United Kingdom, while the main pear export markets are Europe, Fart East and Asia, followed by the Middle East and Russia as illustrated in the charts below.

APPLE EXPORTS PER MARKET SEGMENT



Source: Agri-Hub 2024

PEAR EXPORTS PER MARKET SEGMENT



Source: Agri-Hub 2024

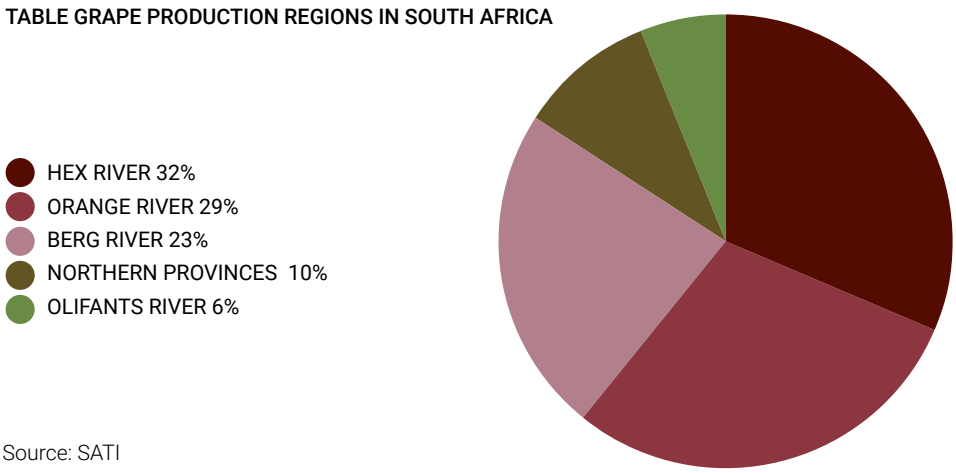
3.4. Table Grapes

Table grape overview

Table grapes are grown to be eaten as fresh fruit, unlike wine grapes grown specifically for making wine. South Africa ranks third among table grape exporting countries in the southern hemisphere after Chile and Peru. There are a total of 19,500 ha's of table grapes planted in South Africa providing in the region of 100,000 jobs.

Where are table grapes grown?

Table grapes are grown in many provinces in South Africa with the earliest harvest starting in the north and moving down to the south of the country as the season progresses. The biggest production region is the Western Cape, followed by the Northern Cape and then the Limpopo province.



Source: SATI

When are table grapes harvested?

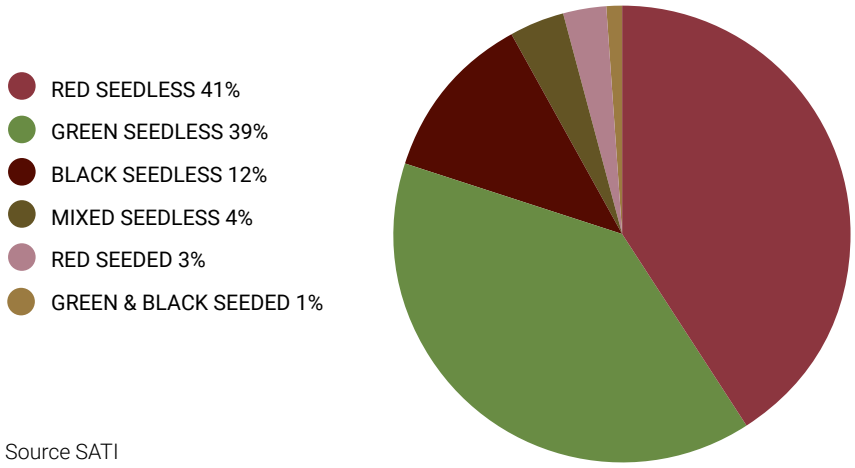
With the variety of different climatic areas in South Africa, the table grape industry can supply its markets with different cultivars over a fairly long period of time. In October, picking starts in the northern regions and along the Orange River; in December harvesting moves to the Olifants River region, followed by the Berg River region and finally, the Hex River Valley ends the season around the end of May.

Table grape varieties

Traditionally table grapes were often categorised as seeded and seedless grapes. However, seeded grapes have declined in popularity such that they only make up 4% of South Africa's total exports with the bulk of that being a red seeded variety called Red Globe.

Seedless grapes are categorised by colour in three main categories being red, green (sometimes referred to as white) and black. Seedless grapes are also packed in mixed packs often containing both red and green grapes. Red and green seedless grapes are the most popular followed by black seedless as reflected in the chart below.

TABLE GRAPE EXPORTS BY CATEGORY 2023/24 SEASON



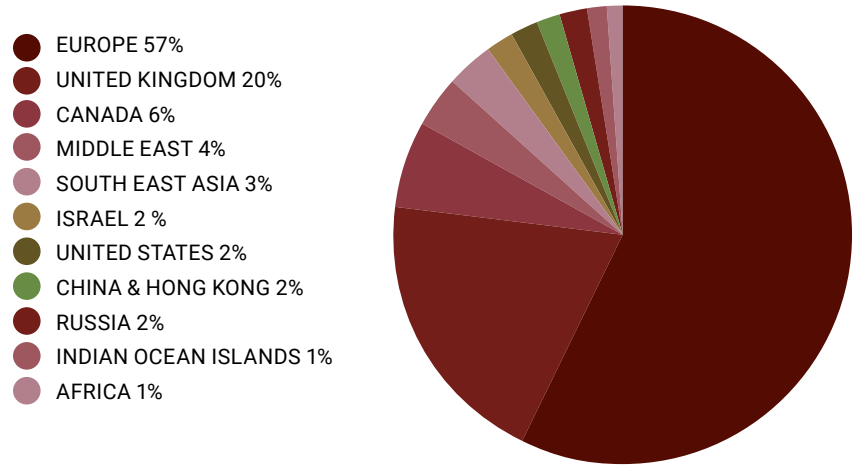
Source SATI

Grape breeders have released many new cultivars in recent years with improved characteristics such as yield, shelf life, taste and size. Popular red varieties in order of export volume include Crimson, Sweet Celebration, Scarlotta and Tawney. Popular green varieties include Sweet Globe, Prime, and Autumn Crisp, while popular black varieties include Sable and Sweet Joy.

Table Grape Exports

As illustrated in the table below, Europe is by far the biggest export market for South Africa at 57%, followed by the UK at 20%, then Canada, the Middle East and South East Asia.

TABLE GRAPES EXPORTED PER MARKET 2023/2024



Source: Agri-Hub 2024

3.5. Stone fruit

Stone fruit overview

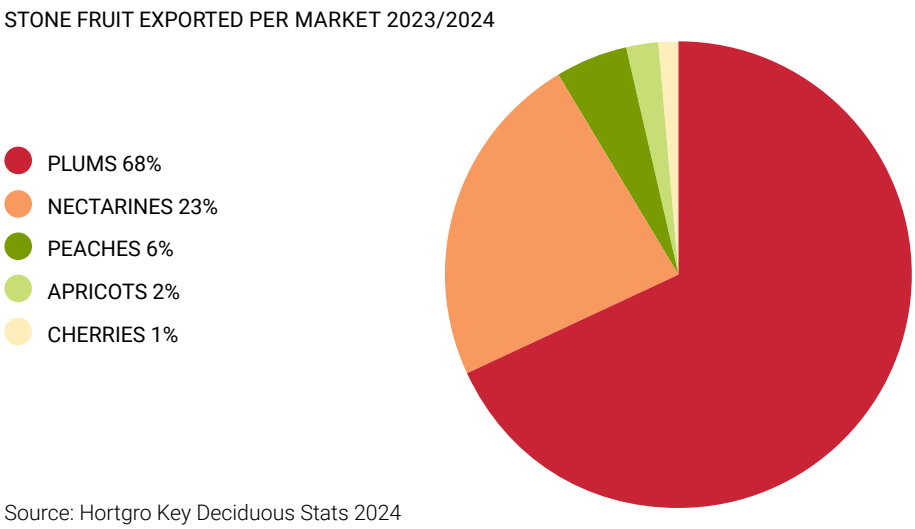
Stone fruit has a pip or stone in the middle of the fruit that is surrounded by a fleshy body. The five types of stone fruit exported from South Africa are peaches, apricots, nectarines, plums and cherries. There are 822 stone fruit growers in South Africa creating just over 20,000 jobs.

Where is stone fruit grown in South Africa?

Stone fruit also has a winter chilling requirement like pome fruit, however there are many low and medium chill varieties available enabling some stone fruit varieties to be grown in warmer climates in the north of the country. Most stone fruit is however grown in the Mediterranean climate of the Western Cape, with smaller quantities grown in the Eastern Cape, Limpopo and Mpumalanga provinces. As with table grapes, the earlier production starts in the north with later production in the Western Cape.

What varieties of stone fruit are exported?

Stone fruit cultivars are not very hardy, which makes it more difficult to export the fruit. However, exports, particularly of plums, have grown in the past few years. In 2022/23, 74% of the plums produced in South Africa were exported, while most apricots, peaches and nectarines are processed or dried.



Source: Hortgro Key Deciduous Stats 2024

Stone fruit varieties have short harvest windows and many varieties are required to ensure a consistent supply through the season. Prominent export plum varieties include Angelino, Ruby Sun, African Delight, Laetitita, Fortune, Ruby Star and Songold. Prominent export nectarine varieties include August Red, Tifany, Alpine and Luciana.

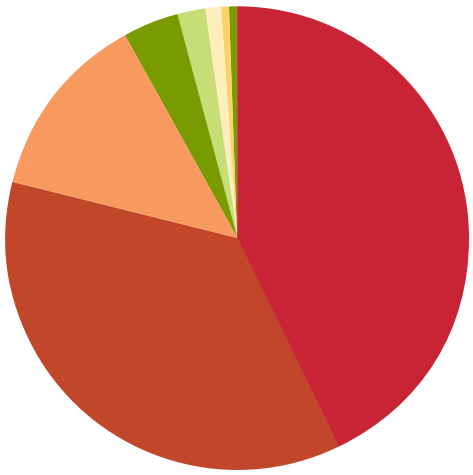
When is stone fruit harvested?

The stone fruit season is relatively short. The plum season runs from November to April. The peach, nectarine, apricot and cherry seasons start around October. The apricot and cherry seasons end around December, while nectarines are largely done by February and peaches in March.

Stone fruit exports

The plum and nectarine export market breakdown is shown below.

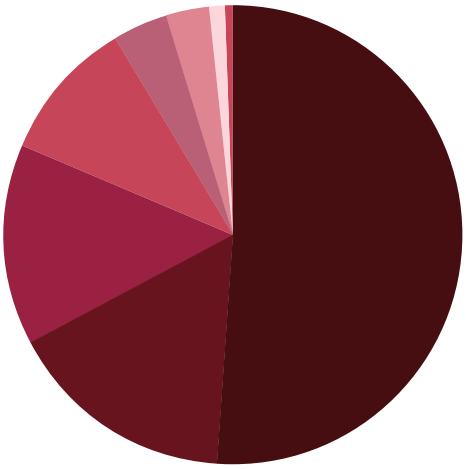
NECTARINES EXPORTED PER MARKET 2023/2024



- EUROPE 43%
- UNITED KINGDOM 36%
- MIDDLE EAST 13%
- USA & CANADA 3%
- RUSSIA 2%
- INDIAN OCEAN ISLANDS 1%
- FAR EAST & ASIA <1%
- AFRICA <1%

Source: Agri-Hub 2024

PLUMS EXPORTED PER MARKET 2023/2024



- EUROPE 51%
- UNITED KINGDOM 16%
- MIDDLE EAST 14%
- USA & CANADA 10%
- RUSSIA 4%
- FAR EAST & ASIA 3%
- INDIAN OCEAN ISLANDS 1%
- AFRICA <1%

Source: Agri-Hub 2024

Europe and the United Kingdom are the primary markets for plums and nectarines followed by the Middle East.

3.6. Subtropical fruit production

Subtropical fruit overview

The three main types of subtropical fruit grown for export in South Africa are avocados, mangoes and litchis.

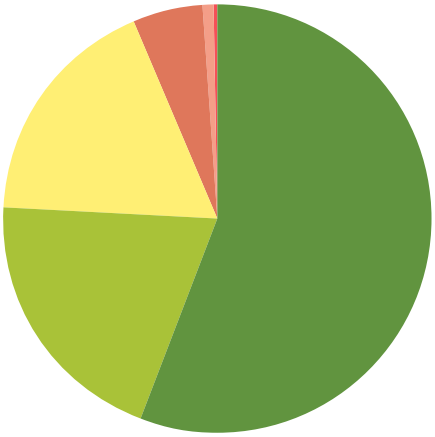
Where is subtropical fruit grown?

The avocado industry has seen significant expansion in recent years and the total hectares of avocados planted in South Africa is estimated at ±20,000ha. Limpopo is the biggest growing region, followed by Mpumalanga and KwaZulu-Natal.

AVOCADO PRODUCTION REGIONS IN SOUTH AFRICA

- LIMPOPO 11086 ha
- MPUMALANGA 3984 ha
- KWAZULU-NATAL 3502 ha
- WESTERN CAPE 1052 ha
- EASTERN CAPE 171 ha
- GAUTENG 15 ha

TOTAL: 19810 ha



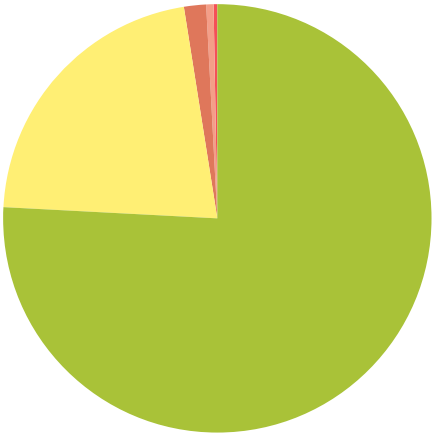
Source: SAAGA 2025

Commercial plantings of mangoes in South African amount to 5,788 ha. The bulk of the production is situated in the Limpopo and Mpumalanga provinces as indicated below.

MANGO PRODUCTION REGIONS IN SOUTH AFRICA

- LIMPOPO 4405 ha
- MPUMALANGA 1239 ha
- WESTERN CAPE 99 ha
- KWAZULU-NATAL 29 ha
- GAUTENG 1 ha

TOTAL: 5788 ha



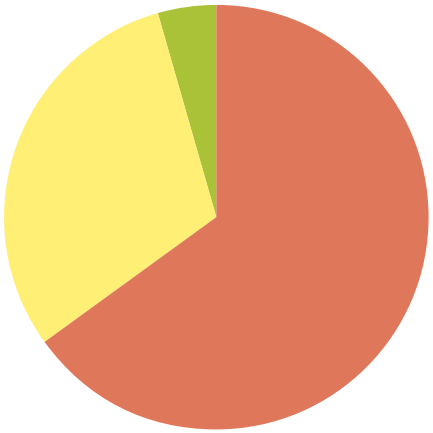
Source: SAMGA 2025

Total commercial litchi plantings in South Africa amount to 1,389 ha with 65% situated in the Limpopo province 31% in Mpumalanga.

LITCHI PRODUCTION REGIONS IN SOUTH AFRICA

- MPUMALANGA 904 ha
- LIMPOPO 426 ha
- KWAZULU-NATAL 59 ha

TOTAL: 1389 ha



Source: SALGA 2025

When are they harvested?
The South African avocado season now runs from February to mid-January following new plantings at higher elevations and in the south of the country.
The mango season starts in December and ends in April.
The main litchi season runs from the end of November to the end of January.

Varieties
Eighty percent of new avocado plantings in South Africa are the dark-skinned Hass and Hass type cultivars such as Carmen, Gem, Lamb-Hass and Maluma. Green skinned cultivars such as Fuerte, Pinkerton, Ryan and Reed make up the remaining 20%. Dark-skinned cultivars make up 65% of exports and green skins the remaining 25%.

Fuerte

Hass

Tommy Atkins

Popular mango varieties include Tommy Atkins, Kiett, Kent, Shelly and Sensation.

By far the most planted litchi cultivar in South Africa is Mauritius.

Exports
The 3-year average annual avocado production is 154 000 t, of which ±45% is exported fresh (Source: SAAGA). Export volumes are expected to continue growing for the foreseeable future due expansion of plantings. The biggest avocado export markets are Europe and the United Kingdom with these two markets accounting for over 90% of exports.

The South African mango production is mainly sold on the local market and for processing with only 8% of the crop exported in 2024 (6,358 tonnes - Source SAMGA). The biggest mango export market is the Middle East.

The litchi industry is export focused with 60% of the crop totalling 2,637 tonnes exported in the 2023/24 season (source: SALGA). The biggest export markets are Europe, the United Kingdom and the USA.

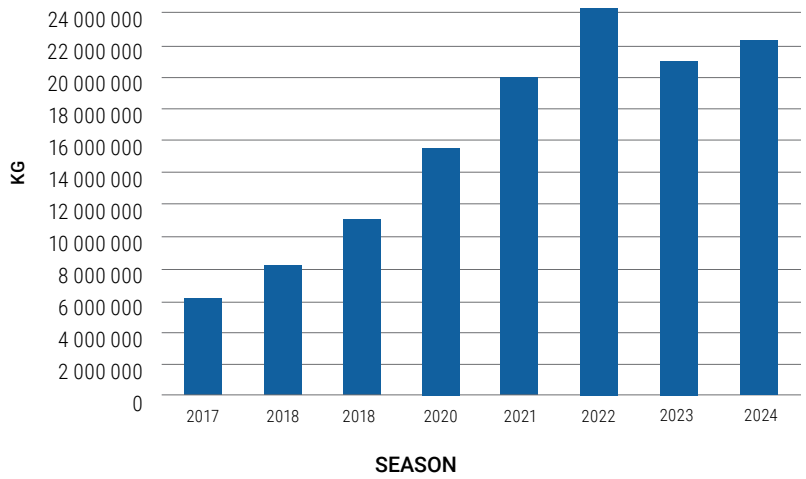
3.7. Blueberries

Overview

The blueberry industry has grown rapidly in South Africa (refer to chart below) following the development of southern highbush varieties, which combine genetics from traditional northern highbush and low-chill varieties. These hybrids were specifically bred to tolerate warmer conditions and require fewer chilling hours, making them ideal for South Africa's climate and enabling them to grow throughout South Africa. New varieties also have a better shelf life, which together with advancements in container technology, enable blueberries to be shipped by sea freight.

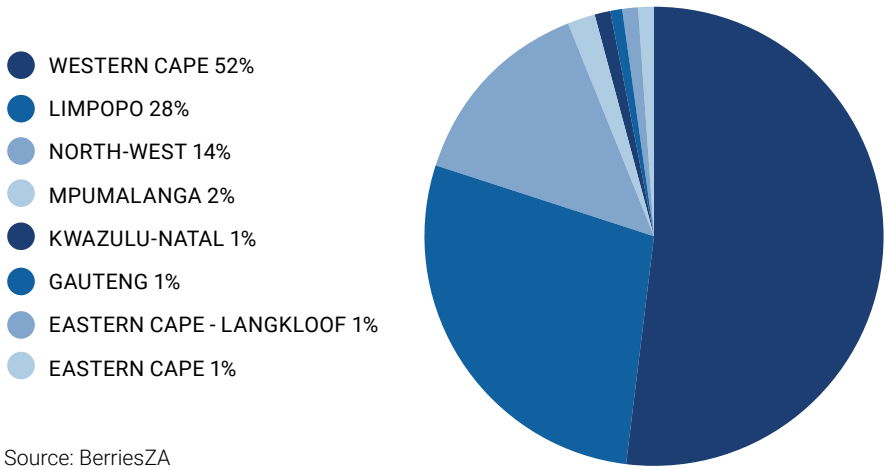
There are many blueberry varieties grown in South Africa with many of them being proprietary varieties exclusive to specific export companies.

BLUEBERRY HISTORICAL EXPORTS



Source: BerriesZA

BLUEBERRY PRODUCTION REGIONS IN SOUTH AFRICA



Source: BerriesZA

Western Cape is the biggest production region with 52% of the planted area followed by Limpopo with 28% and the Northwest Province with 14%.

When are they harvested?

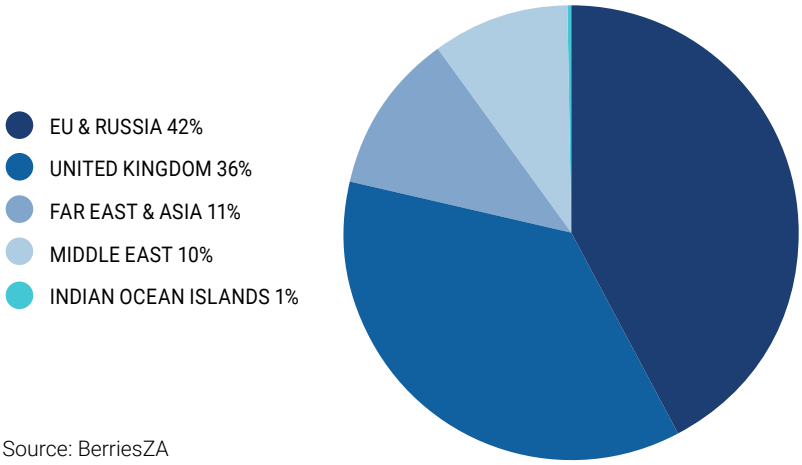
As with table grapes and stone fruit, the northern areas harvest first and the Western Cape last. The South African blueberry season starts in mid-July and wraps up early January.

Exports

Initially blueberries were exported by airfreight but improvements in varieties and reefer technology have enabled blueberries to be shipped by sea freight. While sea freight is now the predominant mode of transport for blueberries air freight still plays an important role in getting fruit quickly into the market in top quality when prices are high.

The biggest export markets for blueberries from South Africa are the European Union and Russia, followed by UK then the Far East/Asia and the Middle East.

BLUEBERRIES EXPORTED PER MARKET 2024



Source: BerriesZA

4. The fresh fruit trade chain

The trade chain describes the flow of fruit as it moves from the farm where it is grown and harvested to its final destination, the market and ultimately consumers as illustrated by the schematic below. As the fruit passes along the trade chain there are many players, processes and costs involved. This book aims to provide a comprehensive overview of the key steps and activities within the trade chain.

THE FRESH FRUIT TRADE CHAIN

The fresh fruit export sector is complex and carries considerable risk which must be mitigated by exporters and other key role players. Exporters must meet evolving market standards across a wide range of areas including innovation, quality, food safety, environmental impact, social responsibility, and regulatory compliance. These expectations are particularly challenging given the nature of the product - high-value, perishable, grown in a climate that is often unpredictable and sold into markets with often unstable prices. Add to that a fragile and intricate logistics chain and the risk of customer payment default and it becomes clear that success in this industry demands deep knowledge, extensive experience, and a strong commitment to excellence.

CHAPTER TWO

Fresh fruit economics

1. The Economics of fruit farming

Fruit farming in South Africa for the export market is a highly competitive, capital-intensive and technologically advanced enterprise. Growers operate in a global marketplace, where they must meet stringent quality standards, adhere to strict compliance requirements and compete with producers from other major fruit-exporting countries. This requires continuous investment in advanced agricultural technologies, infrastructure, and staying abreast of the latest production practices.

The capital intensity of fruit farming stems mainly from high orchard establishment and maintenance costs. The use of modern techniques such as precision agriculture, trellising, netting, the latest cultivars, drone technology, irrigation scheduling technology and data analytics is increasingly essential for increasing yields and packouts, reducing resource use and improving overall efficiency.

With climate variability, market fluctuations and input cost inflation adding further pressure, South African fruit farmers must continuously innovate and improve yields and export packouts to remain viable. Those who fail to optimise performance, risk falling behind in an industry where yield, quality and cost-effectiveness determine long-term success.

1.1. Orchard establishment and production costs

The table below provides an indication of current apple production costs (source: Hortgro Industry Perspectives and Economic Indicators 2024). The left-hand column shows the cost of establishing a new apple orchard, which is currently R665,448 per hectare without nets. Farmers are increasingly installing nets on new orchards which adds in the region of R350,000 per hectare, taking the total establishment cost to around a million rand per hectare, or more for ultra high-density plantings.

Once a new orchard is established, it typically takes around two years to come into production. The annual orchard maintenance costs for a new, non-bearing orchard, totalling R171,340 per hectare is illustrated in the second column. The third column illustrates the annual production costs of an orchard in full production which is in the region of R659,719 per ha. These figures include packing and overhead expenses and allowance for depreciation.

We will not cover the production costs of other fruit commodities such as citrus, table grapes, subtropical fruit etc, in this manual. However, the general principal of high orchard establishment and maintenance costs are shared across all fruit commodities grown for export, with some fruit types like blueberries being significantly more expensive to farm.

CROP BUDGETS: POME FRUIT

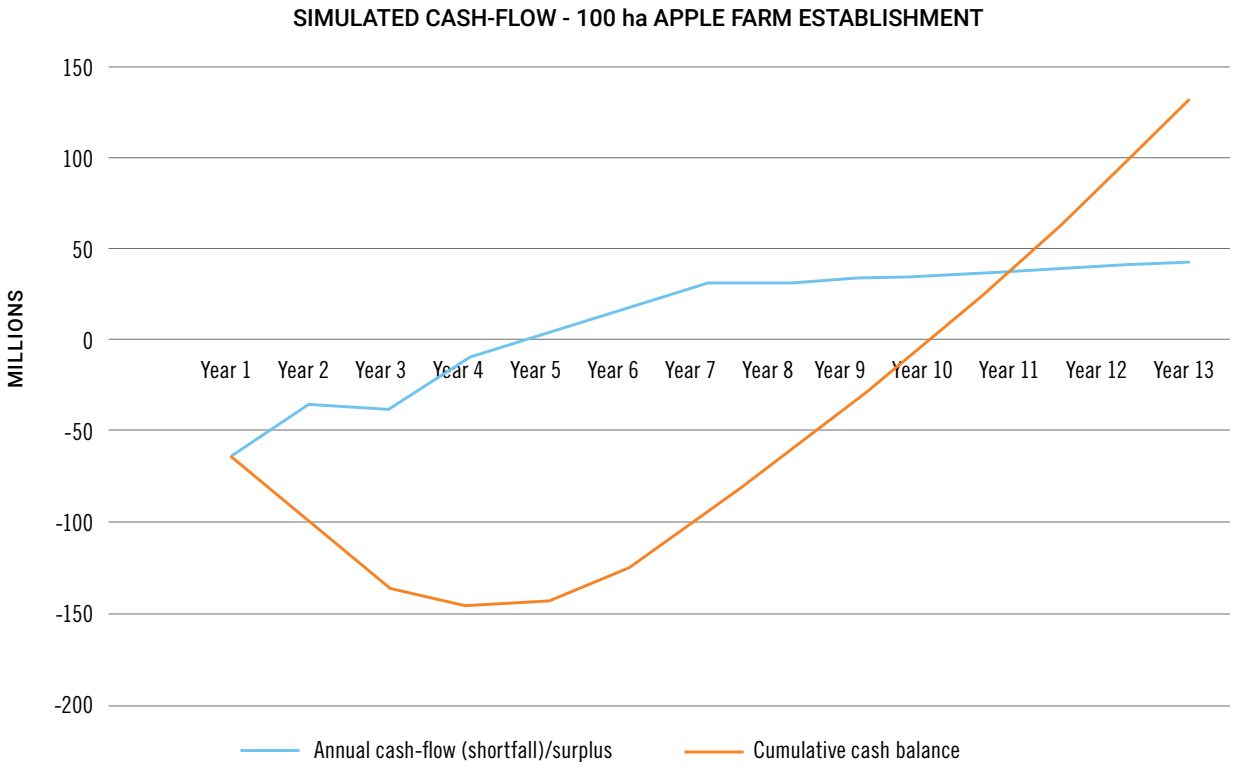
	APPLES		
	ESTABLISH-MENT	NON-BEARING	BEARING
	RAND	RAND	RAND
YIELD (TON/HA)			**65**
NUMBER OF TREES PER HA	1667	1667	1667
PRE-HARVEST COSTS	**532 462**	**65 219**	**149 880**
PLANT MATERIAL	170 603	3 412	0
LANDCLEARING, SOIL MAPPING & FUMIGATION	61 704	0	0
LAND PREPARATION & RIDGING	73 849	0	0
IRRIGATION (DESIGN & MATERIAL)	64 623	0	0
DRAINAGE	46 253	0	0
TRELLISING	66 755	0	0
FERTILIZER	12 025	28 144	31 406
HERBICIDES	3 267	3 267	3 267
PESTICIDES	490	5 296	20 789
FUNGICIDES	1 320	2 279	12 659
REST BREAKING AGENTS/ GROWTH REGULATORS	0	241	1 602
CONSULTANTS	1 681	1 681	1 681
SEASONAL LABOUR	17 541	4 850	35 747
FUEL (DIESEL)	2 941	3 650	13 022
REPAIRS & MAINTENANCE	3 096	3 843	13 710
ELECTRICITY	4 067	8 133	12 325
GENERAL	2 247	422	422
POLLINATION	0	0	3 250
HARVEST & POST-HARVEST	**0**	**0**	**377 164**
TRANSPORT RENTAL	0	0	37 499
PACKAGING	0	0	300 990
SEASONAL LABPOUR	0	0	35 854
FUEL (DIESEL)	0	0	1 961
REPAIRS & MAINTENANCE	0	0	861
OVERHEAD COSTS	**132 987**	**106 120**	**132 675**
FIXED LABOUR	32 269	32 269	32 269
WATER COSTS	2 192	2 192	2 192
OTHER OVERHEADS	41 287	41 287	41 287
INTEREST ON LOANS	30 617	3 750	30 305
DEPRECIATION ON ORCHARD	26 623	26 623	26 623
TOTAL COST	**665 448**	**171 340**	**659 719**

* These budgets are only a guideline and should be adapted to your own specific situation.
* Other overheads - admin., bank charges, general repairs, local taxes, postage, phone, auditing, secretarial.
* The fumigation figures included are based on in-row fumigation.
* Plant material excludes windbreaks.
* Costs may vary according to farm size and area.

Source: Hortgro industry perspectives and economic indicators 2024

1.2. Cash-flow Implications

The graph below simulates the net cash-flow position before finance for a newly established 100ha apple farm with plantings established over a three-year period (source: FPEF own calculation).



The blue line represents the farm's annual year end net cash-flow position, while the orange line represents the farm's net cumulative cash-flow position.

Following the blue line, the farm has a negative annual cash-flow up to year 5 as the new orchards come into production. This initial negative cash-flow results in the new farm requiring a peak funding requirement of R150 million in year 5, illustrated by the lowest point on the orange line. This equates to a total initial cost of R1.5 million per hectare which includes the land, orchard establishment cost, equipment, and initial orchard maintenance costs of non-bearing orchards. From year 6 onwards the farm has a positive cash flow, as the yields increase towards full production. The farm takes 10 years to break even as seen by the point at which the orange line crosses the 0 point on the vertical axis.

The above cash-flow forecast for a typical commercial apple farm illustrates:
- the large sum of money required to enter commercial fruit farming,
- the long timeframe for farming enterprises to start generating profits and recover the establishment costs,
- and the enormous financial risk that farmers take.

This underlines the necessity for farmers to work with export agents who can maximise returns given the large financial exposure and high risk that farmers face.

2. The Economics of fruit export

There are costs involved at every stage of the trade chain. Apart from the costs of producing the fruit, as illustrated in the previous section, there are many other expenses such as retail margins, importers' commission, freight costs, port costs, exporters' commission etc.

The table below illustrates the typical costs for the export of a single 12.5kg carton of apples to the European or UK retail market. The figure at the top of the table illustrates the retail price of the apples, which is the price the consumer pays when buying apples in the supermarket. From this value each successive cost in the trade chain is deducted to reach the farm gate price, which is the net amount the farmer is paid for the apples, out of which they must cover their production costs to make a profit.

APPLE EXPORT COSTS TO EU/UK RETAIL MARKETS FOR A 12.5KG CARTON

	APPLES	
	Rand	**%**
SALES PRICE	**R460,73**	**100%**
RETAIL MARGIN	R126,87	27,5%
DELIVERY PRICE RECEIVER	**R333,86**	**72,5%**
IMPORTER COMMISSION	R22,70	4,9%
OVERSEAS HANDLING COST	R27,45	6,0%
CARRIAGE INSURANCE FREIGHT (CIF)	**R283,72**	**61,6%**
SHIPPING & ASSOCIATED COSTS	R67,83	14,7%
EXPORTERS COMMISSION	R12,22	2,7%
FREE CARRIER (FCA) / FREE ON BOARD (FOB)	**R203,67**	**44,2%**
LANDSIDE COST	R9,63	2,1%
DELIVERED IN PORT (DIP)	**R194,04**	**42,1%**
TRANSPORT & COLD STORAGE	R15,95	3,5%
EX PACK HOUSE (EXW)	**R178,09**	**38,7%**
PPECB INSPECTION LEVY	R0,91	0,2%
HORTGRO LEVIES	R1,02	0,2%
PACKING COSTS	R64,88	14,1%
FARM GATE	**R111,28**	**24,2%**

Source: Hortgro Industry Perspectives and Economic Indicators 2024

The costs in the table above are only an indication and will differ according to factors such as the grade, variety, customer, exchange rate and packhouse location etc.

At the top of the table, one carton of apples was sold for an equivalent of R460.73 on the UK retail shelf. The biggest cost in the value chain in this example is the retailers' margin of R126.87 per carton. At face value this may seem excessive, but retailers have high operating costs, and it is a very competitive business with low margins (for example the largest supermarket in the UK, Tesco, had an average net profit before tax of 2.3% over the past five years – source: Tesco PLC 2024 Annual Report).

Moving down the sheet, we see the importers commission was R22.70 and the total overseas handling and logistics costs were R27.45 per carton. The total sea-freight and associated costs were R67.83 per carton being the second biggest cost in the value chain. This brings us to the FCA value (or FOB in the case of SRV shipping) of R203.67, which is effectively the portion of the total sales value which is returned to South Africa after all foreign costs have been deducted (only 44%). In terms of costs incurred in South Africa, the packing and packaging cost of R64.88 per carton is the biggest cost in the value chain between the farm gate and the port.

At farm gate level, after all costs have been deducted, the farmer is paid R111.28 per carton in this example, representing just over 24% of the retail sales value. From this amount the farmer must still cover the on-farm operating costs to realise a profit.

While "middle men" are often incorrectly seen as unnecessary players in the value chain who add cost without providing commensurate benefit, it must be noted that each player in the above value chain provides a vital service, be it the packer, exporter, importer or freight forwarder. None of these players can be removed from the value chain without replacing the vital service they provide and so the question is not whether they are necessary but whether they are performing their tasks effectively and efficiently in a cost-effective manner. Some larger players such as big growers or exporters undertake a measure of vertical integration where they perform functions in the value chain in-house, however, typically significant economies of scale are necessary before this can be done cost effectively.

Exporters typically manage the commercial relationships with service provides in the value chain and it is their responsibility to optimise these relationships, processes and costs to maximise returns to growers. Exporters also need to understand the costs in the value chain to each respective market they supply enabling them to make sound marketing decisions.

CHAPTER THREE

Production

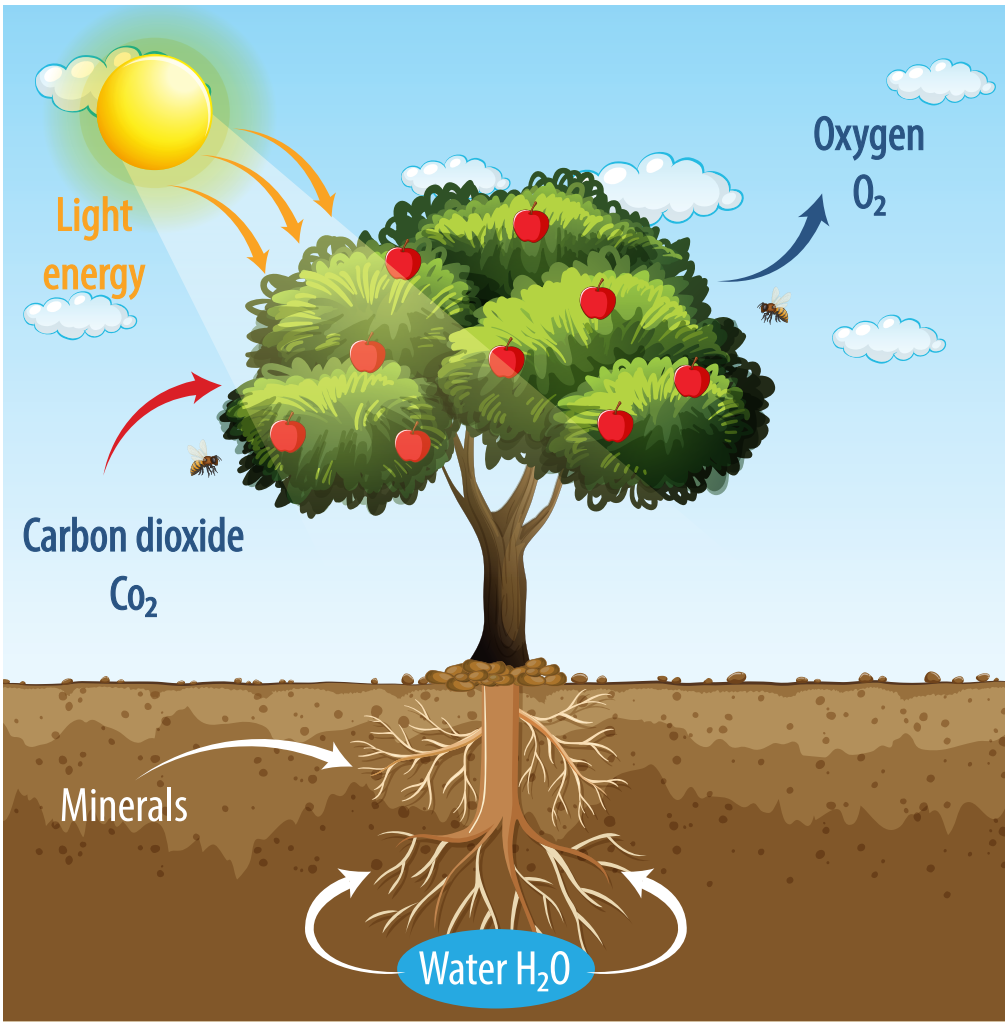
This chapter presents an overview of fruit production management at the farm level.

1. Key terms and concepts

At the start of this chapter, there are several key terms and concepts we will introduce to provide the necessary foundation for the rest of the chapter.

1.1. Key elements required for plant health

DIAGRAM ILLUSTRATING THE KEY ELEMENTS FOR PLANT HEALTH



Healthy fruit tree or vine development depends on a combination of essential environmental factors and proper care. Water is vital for transporting nutrients, maintaining cell structure, and supporting photosynthesis, while sunlight provides the energy needed for this process to occur and is vital for fruit to colour. Oxygen is crucial for respiration, allowing the tree to convert sugars into usable energy and carbon dioxide from the air is used during photosynthesis to produce that energy in the first place.

Nutrients, in the form of minerals, absorbed mainly through the roots, support overall growth and fruit production. A balanced supply of macronutrients like nitrogen, phosphorus and potassium, along with micronutrients, ensures strong roots, lush foliage and quality fruit. Together, these elements create the foundation for a healthy, productive fruit tree. The end goal of many of the key farming practices is to optimise the tree or vines access to these vital elements.

1.2. Deciduous and evergreen trees and vines

Evergreen and deciduous fruit trees and vines differ primarily in how they respond to seasonal changes. Evergreen fruit trees, such as citrus (e.g. oranges, lemons) and many subtropical fruits (e.g. avocados, mangoes), retain their leaves year-round, allowing them to photosynthesise continuously in suitable climates. In contrast, deciduous fruit trees and vines - like pome fruits (e.g. apples, pears), stone fruits (e.g. peaches, plums, cherries) and table grapes - shed their leaves during the cooler months as a natural response to colder temperatures and reduced daylight. This dormancy period helps them conserve energy and prepare for vigorous growth and fruiting in the spring. Understanding these differences is important for proper planting, pruning and maintenance practices based on seasonal cycles.

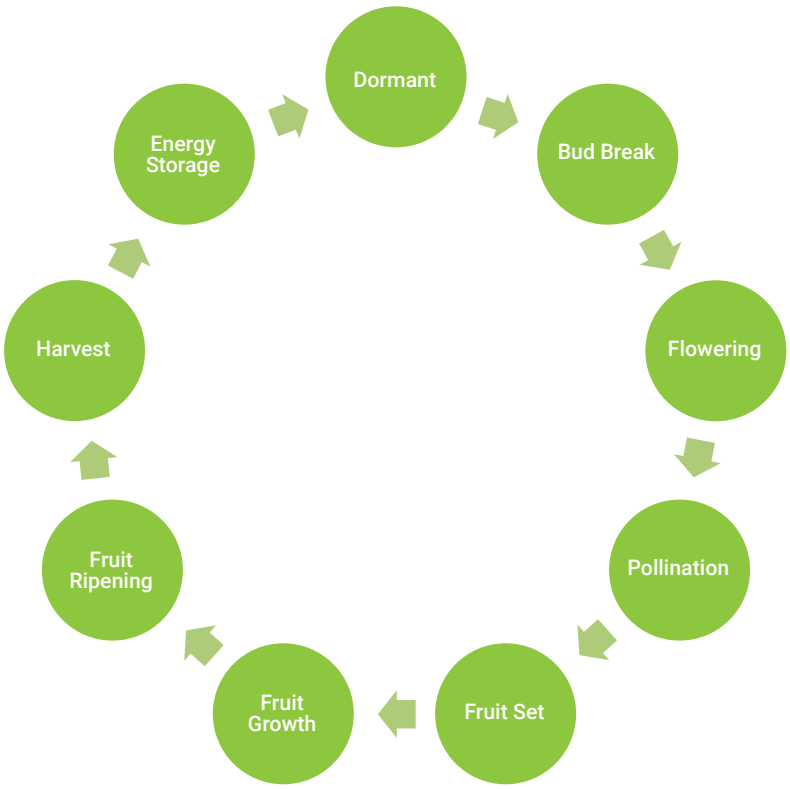
Evergreen citrus tree

Dormant deciduous orchard
Photo credit: Anna Mouton

1.3. Seasonal cycle

The diagram below shows the seasonal cycle of a deciduous tree or vine. The cycle for an evergreen tree is similar but does not include a period where the tree is dormant followed by bud break.

DIAGRAM ILLUSTRATING THE SEASONAL CYCLE OF A DECIDUOUS TREE OR VINE



It's important for fruit farmers to pay close attention to the different stages of growth their trees go through during the year, known as phenological changes. These stages include things like dormancy, bud break, flowering, fruit set, and ripening. Each stage has different and often specific needs, so farmers must adjust how they care for their trees - such as changing how much they water, when they prune, or what kind of nutrients they provide. For example, trees need more water and nutrients during fruit development but almost none during dormancy. The timing of these phenological stages differs for each fruit type and variety, adding complexity to the farmer's task.

1.4. Cultivars and varieties

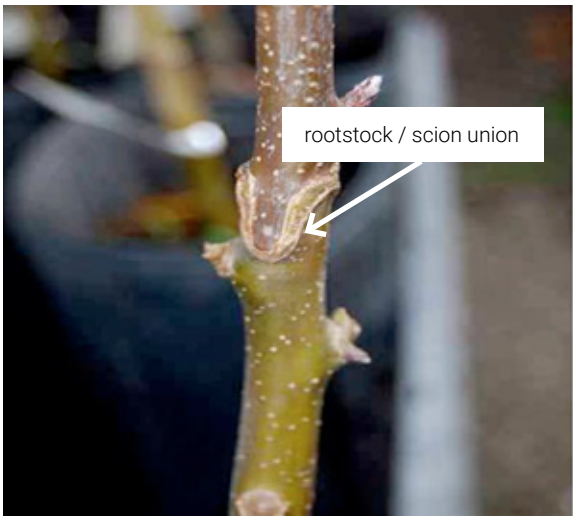
A fruit variety or cultivar is a specific type of fruit plant that has been selected and/or bred for specific traits, such as taste, size, colour, yield, or resistance to pests and diseases. These are usually developed through careful breeding, where plants with desirable characteristics are cross-pollinated to create offspring that inherit the best traits from each parent. Alternatively, some new varieties originate from naturally occurring genetic mutations which are superior to the parent plant. In some cases, new cultivars are also created using modern techniques such as genetic modification, although this is not common in the fruit industry as many key markets are opposed to genetically modified fruit. Fruit breeding and selection is a slow and expensive process taking many years.

Plant Breeders' Rights (PBR) are a form of legal protection that give plant breeders exclusive control over the new cultivars they develop. This means the breeder has the right to produce, sell and distribute the cultivar, or to license others to do so. PBR helps protect the breeder's investment of time and resources, encourages innovation and supports the development of improved plant varieties with better yields, quality and resistance to pests or diseases. Plant breeders recover their investment in breeding new varieties through charging royalties for the planting and/or sale of fruit from their varieties.

High-performing cultivars are especially important because they help farmers grow fruit that meets market demands, adapts well to local growing conditions, and produces consistently high yields and good quality. Choosing the right cultivar can make the difference between a successful harvest and one that struggles due to customer resistance, poor quality, low productivity, or vulnerability to environmental stress or disease.

1.5. Rootstock

A fruit tree rootstock is the lower part of a tree, including the roots, onto which a chosen fruit variety (called the scion) is grafted or budded. The rootstock plays a big role in determining the tree's overall vigour, size, disease resistance, tolerance to soil conditions and how early or late it bears fruit. While the scion controls the type and quality of fruit produced, the rootstock influences how the tree grows and adapts to its environment. Selecting the right rootstock therefore plays a big role in the performance of the orchard.



Rootstock / scion union

1.6. Plant propagation

Fruit tree breeders and nurseries use specific propagation techniques like tissue culture, rooting, grafting and budding, so that off-spring are genetically identical to the parent plant to ensure that the unique characteristics of a rootstock or cultivar are maintained. These techniques are collectively known as vegetative propagation. Unlike growing from seed, which can produce varied results, vegetative propagation guarantees the new tree will have the same fruit quality, growth habits and other traits as the parent cultivar. This ensures consistency and reliability for both growers and consumers.

1.7. Fruit tree nurseries

Fruit tree nurseries produce budded or grafted nursery trees for planting by fruit farmers. These methods involve joining a piece of the desired variety (called a scion) to a rootstock, so it grows as a clone of the original plant. The process to produce a new nursery tree ready for planting typically takes about 18 months. The first step is to cut sections of stem from the rootstock mother block, which are dipped in a rooting hormone and placed in a growing medium to develop roots. This process is called rooting. Once the rootstock cuttings are well established the scion is typically grafted onto the rootstock using budding as illustrated below. The buds are cut from a variety mother block and after budding onto the rootstock grow out to form the scion/fruiting wood (top part of the fruit tree). Alternatively, many modern nurseries are using tissue culture to multiply planting material to produce virus free plants.

Bare rooted nursery trees Photo credit: Anna Mouton

Scion growing out after budding

Deciduous nursery trees are supplied to farmers in the dormant stage in bundles with no soil/growing medium on the roots while evergreen trees are typically supplied in bags in soil/growing medium.

1.8. Chilling requirement

Deciduous fruit trees have a winter chilling requirement. This means that they need a period of cold temperatures during winter to break dormancy and generate flower buds during spring. This cold period is measured and calculated in chill hours. There are different methods of calculating chill hours which are based on the number of hours below a certain minimum temperature also factoring in negative chill meaning warm days or spells reduce the overall chill accumulation. Without enough chilling, the tree may have delayed or uneven bud break, poor flowering, and reduced fruit set. Different varieties have different chilling needs from low chill to high chill, so it is important to match a variety with the local climatic conditions. This is why many deciduous fruit varieties are grown mainly in the Western Cape which has cold nights and cool days during winter. Most commercially grown apple varieties in South Africa have a high chilling requirement, while table grapes have a low chilling requirement. Stone fruit varieties range from low chill to high chill varieties.

1.9. Trellising/Support systems

Fruit support systems, such as trellising, offer several key benefits for fruit production. Most trellising systems are made using poles and wire as shown on the right. By training trees or vines to grow along a structured support, trellising improves growth rate, sunlight exposure and air circulation, which helps boost fruit quality and reduces the risk of pests and diseases. It also makes orchard tasks like pruning, spraying and harvesting easier and more efficient, saving time and labour. Trellising speeds up tree growth and can support higher-density plantings, leading to better land use and potentially earlier and greater yields. Additionally, it helps manage plant growth and promotes a more organised and productive orchard layout.

Young trees on a support system/trellis

Photo credit: Anna Mouton

1.10. Netting

Covering fruit orchards with shade netting provides several important benefits that help improve fruit quality and protect crops. Shade netting reduces the intensity of sunlight, helping to prevent sunburn on fruit. It also offers protection from hail, strong winds, birds and some insects, which can damage crops or reduce yields. The netting creates a more controlled microclimate, lowering temperature extremes and reducing water loss from evaporation, which can improve plant health and reduce irrigation needs. Overall, shade netting supports more consistent fruit development, improves crop protection and can lead to better yields and higher packouts. Although it is expensive, it is becoming the norm in many fruit types in South Africa as the benefits result in improved financial performance which often repays the initial investment within a few years.

Shade netting covering orchard

Photo credit: Anna Mouton

1.11. High density plantings

High-density planting in fruit orchards offers several advantages over traditional low or medium-density planting, which has driven a shift toward more intensive planting systems. By planting trees closer together, high-density orchards allow for more efficient use of land, maximising the number of trees per hectare. This often leads to earlier fruit production and higher yields per unit of land, as the trees reach full production more quickly. Additionally, high-density planting allows for better control over factors like pruning, irrigation, and pest management.

High density planting of young trees

Photo credit: Anna Mouton

2. Production practices

2.1. Establishing orchards

The lifespan of a typical orchard or vineyard is 20 - 30 years, or more in cases. As set out in chapter two, it is a large financial investment with a long payback period, and it is therefore vital that farmers give new orchards the best chance of success. The key steps in establishing a new orchard are set out below.

Variety/Cultivar choice

A farmer must consider the following when deciding which variety or cultivar to plant:

- consumer demand for the fruit,
- suitability for farms climate, soil, topography etc.,
- yield and quality attributes,
- disease tolerance/susceptibility,
- royalty fees and exclusive marketing arrangements.

Rootstock choice

A suitable rootstock must be selected taking into consideration factors such as the soil, drainage, climate, scion, planting density and disease tolerance.

Order nursery trees

Nursery trees need to be ordered well in advance (typically at least two years prior to planting), considering that they take 18 months to cultivate in the nursery and that many popular varieties are in short supply. It is strongly advised that only certified nurseries are used. Big, strong, disease-free nursery trees are important for high performance.

Orchard layout

The orchard layout must be carefully planned considering factors such as drainage, soil, slope, row orientation for good light penetration, prevailing wind direction, length of rows and planting density.

Land preparation

Land preparation involves the following key steps:

- Land clearing and levelling if not previously cultivated.
- Digging profile holes to evaluate any soil physical limitations (e.g. shallow soils, poor drainage).
- Soil analysis to evaluate soil chemical properties such as pH and nutrient status.
- Digging drainage ditches if necessary.
- Digging trenches for irrigation lines and installing irrigation lines.
- Application of agricultural lime to rectify pH.
- Deep cross ripping to loosen soil.
- If soil is shallow ridging is often used to increase soil depth
- Erect trellising/support
- Erect shade net

Bulldozers with large ripper tines as illustrated above are commonly used for ripping in the Western Cape.

Planting trees

Deciduous fruit trees and vines are normally planted as dormant, bare rooted nursery trees in July to August, while evergreen trees are typically planted in early summer. Care must be taken to plant trees at the correct depth without damaging roots and in evergreen trees young trees must be protected from heat and moisture stress.

2.2. Irrigation

Good irrigation management is essential in commercial fruit tree orchards to ensure healthy crop growth, maximise yields and use water efficiently. Two widely used methods in the fruit industry - drip irrigation and micro jet sprinklers - offer precise water application while conserving water and reducing disease pressure. Both systems can be integrated with fertigation, which delivers nutrients directly to the root zone, improving uptake and minimising waste.

Irrigation methods

Drip irrigation delivers water slowly and directly to the root zone through pressure regulated emitters placed along drip lines. This method significantly reduces evaporation and runoff, making it ideal for water-scarce regions. Drip systems offer superior control, allowing growers to apply water and nutrients precisely where and when needed, promoting uniform tree growth and fruit development. Fertigation through drip irrigation ensures even nutrient distribution and reduces the need for mechanical fertilizer application.

Drip irrigation

Micro jet sprinklers

Photo credit: Anna Mouton

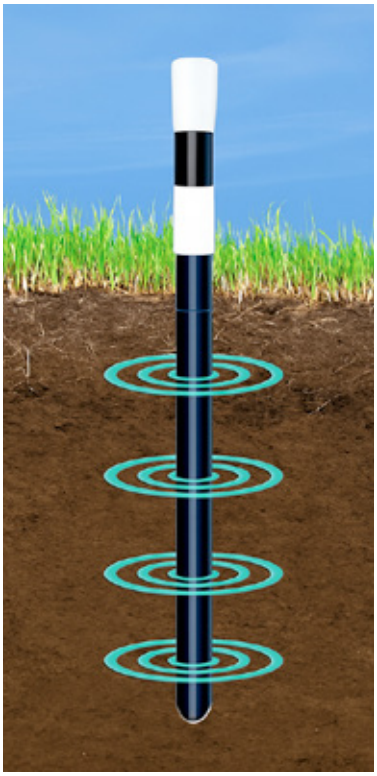
Micro jet sprinklers, on the other hand, emit water in a fine spray pattern, covering a broader area around the tree. This method can help maintain soil moisture over a larger root zone and is particularly beneficial during the early stages of tree development. Micro jets also provide some cooling benefits and can help reduce frost damage. Though they lose more water to evaporation compared to drip systems, they are easier to inspect and maintain, can support under-canopy vegetation when needed and facilitate evaporative cooling of the orchard.

Both methods support precise scheduling and moisture monitoring, allowing orchard managers to fine-tune irrigation based on weather, soil type and crop needs. When well-managed, these systems promote water conservation, improve nutrient efficiency and support sustainable, high-quality fruit production.

Irrigation scheduling

Modern irrigation scheduling technology plays a critical role in optimising water use in commercial fruit orchards. By incorporating tools like moisture probes, weather stations and computer models, growers can make informed decisions that align water application with the actual needs of the trees, leading to better yields, healthier orchards and significant water savings.

Electronic soil moisture probes provide real-time data on how much moisture is available in the root zone. This helps avoid both over-irrigation, which can lead to root diseases and nutrient leaching and under-irrigation, which stresses trees and reduces fruit quality. Weather stations collect localised data on rainfall, temperature, wind, humidity and solar radiation - critical factors that influence evapotranspiration (ET), the rate at which water is lost from the soil and plants.



Soil moisture probe schematic

Computer models use data from these tools, combined with variables like tree size, soil type and recent rainfall, to calculate precise irrigation schedules. For instance, larger trees with wider canopies require more water, while sandy soils drain faster and need more frequent irrigation than clay soils. Wind and high temperatures increase evaporation, further affecting water demand. These dynamic models help ensure water is applied only when necessary and in the right amounts, improving efficiency and sustainability.

By integrating these technologies, modern orchard irrigation becomes a proactive, data-driven process that conserves resources while supporting consistent, high-quality fruit production.

2.3. Plant nutrition

Plant nutrition is a fundamental aspect of managing commercial fruit orchards, directly influencing tree health, fruit yield and quality. For optimal productivity, fruit trees require a balanced supply of both macronutrients and micronutrients, each playing specific roles in plant development and physiological function.

Macronutrients are needed in larger quantities and include nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulphur (S). Nitrogen is essential for vegetative growth and leaf development, phosphorus supports root development and flowering and potassium is vital for fruit size, colour and overall quality. Calcium strengthens cell walls and improves fruit firmness, magnesium is a central component of chlorophyll for photosynthesis and sulphur contributes to protein synthesis and enzyme function.

Micronutrients, though required in smaller amounts, are equally important. These include iron (Fe), zinc (Zn), manganese (Mn), boron (B), copper (Cu), molybdenum (Mo), and chlorine (Cl). Iron and manganese are critical for chlorophyll production and enzyme activity, while zinc regulates growth hormones. Boron plays a key role in cell wall formation and reproductive development and copper is involved in lignin synthesis and disease resistance.

Nutrients can be applied using inorganic fertilisers and/or organic sources such as manure and compost. To manage plant nutrition effectively, growers use a combination of soil testing and leaf tissue analysis. Soil tests identify nutrient availability and pH levels, helping to tailor fertilisation programs to specific soil conditions. Leaf tissue analysis provides a snapshot of nutrient levels in the plant, revealing deficiencies that may not be visible yet. Fertigation - the practice of delivering soluble fertilisers through irrigation systems - allows for precise, timely nutrient delivery directly to the root zone, improving efficiency and minimising waste. Many micronutrients are also applied through foliar applications in which the nutrients are sprayed onto the trees with tractor drawn mist blowers.

Irrigation pump room showing fertigation tanks and fertigation dosimeter

Healthy, biologically active soils play a vital role in supporting plant nutrition by enhancing nutrient availability, retention and uptake. Soil microorganisms break down organic matter and convert nutrients into forms that plants can absorb, such as turning nitrogen from organic residues into usable nitrates or ammonium. These microbes also help mobilise micronutrients like iron and phosphorus, which might otherwise be locked in the soil. Additionally, good soil structure, built by biological activity, improves root growth and water infiltration, further supporting efficient nutrient uptake and overall plant health.

2.4. Flowering and pollination

For fruit to develop on a tree, pollination and then fertilisation must take place. Pollination happens when the pollen from the anther of a flower is transferred to a stigma of the same or another flower. The pollen carries the male sperm which fuses with the female egg of the plant and allows fertilisation to take place. Pollen can be carried by bees, birds, insects, wind or water. After the flower has been fertilised, the petals, stamens, styles and stigma start to shrivel up, the fertilised egg develops into a seed and the fruit develops from the ovary.

Lemon Blossom

Bee hives in an orchard

If pollination does not take place, the flower will not be fertilised and will eventually drop off without producing fruit. This is called fruit drop. If there is a big fruit drop, the crop will be small.

Bees are an important pollinator in many fruit types. To support good pollination, commercial fruit farmers of fruit types like apples, stone fruit and blueberries often introduce bee hives into the orchards during pollination.

Some pome and stone fruit varieties are self-incompatible. Therefore, the trees in the orchard cannot self-pollinate requiring other varieties referred to as cross-pollinators to be planted in the orchard to enable pollination.

The role of pollination in table grapes and citrus varies depending on the variety. Most seedless varieties will develop fruit without fertilisation but pollination often still plays a role in fruit development. In some seedless citrus and table grape varieties cross pollination with seeded varieties is not desirable as it can result in the formation of seeds or seed traces. Orchard design is therefore important to avoid undesirable cross pollination in such instances.

2.5. Thinning

Flower and fruit thinning is an important practice in many commercial fruit orchards such as pome fruit, stone fruit and table grapes, to manage crop load and manipulate fruit size. The main goal of thinning is to reduce the number of flowers or young fruitlets early in the season so that the tree can focus its resources - like nutrients, water and energy - on developing fewer, but higher-quality and bigger fruit.

Fruit thinning by hand

Flower thinning is typically achieved by spraying growth regulators during flowering which results in partial flower drop. Hand thinning involves the removal of young fruit soon after fruit set to manipulate the overall crop load and manage the positioning of fruit. Additionally in table grapes, bunches are often trimmed to increase berry size and improve bunch presentation.

2.6. Pruning

Pruning is a crucial practice in commercial deciduous fruit orchards, playing a key role in maintaining tree health, optimising fruit production and ensuring long-term orchard productivity. Primary reasons for pruning include reducing tree complexity, generating healthy fruiting wood and to shape the tree structure, which enhances sunlight penetration and air circulation within the canopy. Improved light exposure is essential for flower bud development and fruit quality (such as colour), while better airflow reduces the risk of fungal diseases and improves spray penetration. In commercial deciduous orchards, pruning typically takes place during the dormant season in winter.

Manually pruning fruit trees

In evergreen fruit orchards, such as citrus, pruning is primarily used to manage tree size and canopy density. Pruning helps control tree height and spread, making orchard management and harvesting more efficient. Pruning encourages a well-structured canopy that allows adequate sunlight to reach all parts of the tree, which is essential for consistent fruiting and even ripening. Unlike deciduous trees, evergreen trees are usually pruned during the summer to minimise regrowth. Often evergreen trees such as citrus are mechanically pruned as seen on the right.

Mechanically pruning fruit trees

2.7. Pest and disease control
Integrated pest management and organic control

Pest and disease control is a vital component of successful commercial fruit orchard management. The most widely adopted approach in modern commercial orchards is Integrated Pest Management (IPM), a strategic and environmentally sensitive method that combines multiple control techniques to manage pests and diseases.

The key premise behind IPM is to monitor pest populations closely and apply control measures only when necessary, based on established economic thresholds. A key tool used to monitor pest populations is manually observing and counting the presence of pests and diseases in orchards referred to as scouting. Rather than relying solely on chemical pesticides, IPM emphasises a combination of biological, cultural, physical and chemical controls. Biological control might involve the introduction or conservation of natural enemies like predatory insects or parasitic wasps. Cultural controls include practices such as crop rotation, pruning, or sanitation to reduce pest habitat. Physical methods might involve barriers or insect traps, while chemical controls - if needed - are used as a last resort and are chosen for their specificity and minimal environmental impact. Food safety and worker health and safety are vital aspects with respect to chemical controls and these aspects will be covered in the following chapter under the compliance section.

In contrast, organic pest and disease control methods operate under strict guidelines that prohibit synthetic chemicals altogether. Organic pest and disease control methods therefore rely mainly on a combination of biological, cultural and physical methods together with natural or organically approved substances. They can be more limited in scope and effectiveness, particularly in high-pressure pest and disease environments which can be challenging.

Disease management
Diseases impacting orchards are broadly categorised into fungal, viral and bacterial types. Each category has distinct characteristics and requires specific control strategies.

• Fungal diseases
Fungal diseases are the most common in fruit orchards and are often spread through spores that thrive in warm, moist conditions. They typically affect leaves, fruit, branches and roots and can rapidly spread across an orchard under favourable conditions.

Common examples include downy mildew in table grapes, citrus black spot, fusarium in apples and phytophthora root rot in avocados.

Cultural control methods include pruning to improve air circulation and removing fallen or infected plant material and ensuring good drainage in the case of fungal root diseases. Chemical control methods are often necessary using the application of fungicides based on disease forecasting and threshold levels, with rotation to prevent resistance.

• Viral diseases
Viral diseases are typically spread by insect vectors, infected planting material, or mechanical means like pruning shears. These diseases can cause stunted growth, leaf mottling, fruit deformation and reduced yields and they cannot be cured once a plant is infected.

Examples of viral diseases that occur in South Africa include citrus tristeza virus and grapevine leafroll virus.

Cultural control methods include the use of certified virus-free planting material and removal of infected trees to prevent spread.

Biological controls include encouraging natural predators or parasitoids of insect vectors and chemical controls include the use of insecticides to manage vectors where necessary based on scouting.

• Bacterial diseases
Bacterial diseases can affect multiple parts of the tree or vine, including blossoms, twigs, fruit and roots. They spread through water, insects, contaminated tools and infected plant debris. These diseases can be particularly difficult to control once established.

Examples in South Africa include fire blight in pome fruit, bacterial spot in stone fruit and citrus canker.

Cultural controls include pruning infected parts, sterilising tools, and managing orchard humidity through proper spacing and airflow. There are few effective chemical or biological controls for bacterial diseases although preventative copper-based sprays are beneficial.

Pest management
Commercial fruit orchards in South Africa face a variety of insect pests that can severely impact fruit quality, yield and tree health if not properly managed. Some common examples include the Mediterranean fruit fly, which infests a wide range of fruit crops such as citrus, peaches and apples by laying eggs inside ripening fruit; false codling moth (FCM), a major pest in citrus, causing internal fruit damage; snout beetles in apples which feed on fruit leaves and young shoots, mealybugs, which excrete honeydew and attract sooty mould and scale insects, which damage plant tissue and also promote fungal growth. Many insect pests are also phytosanitary pests, requiring special protocols for fruit to be shipped to certain markets.

As explained in the opening section of this chapter, control strategies for these pests in South African orchards are typically aligned with Integrated Pest Management (IPM) principles, which emphasise a combination of biological, cultural, mechanical and chemical controls. For instance, biological control methods include the use of natural enemies such as parasitoid wasps and predatory beetles to suppress pest populations. Cultural practices such as sanitation (removing fallen fruit), pruning and managing irrigation to reduce humidity can help create less favourable conditions for pests. Mechanical controls include baited traps and mating disruption, especially for fruit flies and moths respectively. When chemical intervention is necessary, it is applied selectively based on monitoring and economic thresholds and with careful consideration of resistance management and non-target effects. Regular scouting and monitoring using pheromone traps and visual inspections form the foundation of IPM, enabling timely and targeted interventions that reduce reliance on broad-spectrum pesticides and support long-term sustainability of fruit production systems.

A Lynfield trap used in IPM for monitoring fruit fly populations in citrus and other fruit orchards.

Sprayer maintenance and calibration

When chemical control methods are used, chemicals are typically applied by tractor drawn mist blowers. Proper maintenance and calibration of tractor-drawn mist blowers is essential in commercial fruit orchards to ensure effective, efficient and safe application of pesticides and other agrochemicals. Worn or damaged nozzles, pumps and filters can lead to uneven spray distribution, poor coverage, resulting in poor pest and disease control and wasted chemicals.

Sprayer calibration is equally important, as it ensures the correct amount of product is applied per tree or per hectare. Incorrect calibration can result in over-application, which increases production costs, risks excessive chemical residues on fruit, and harms beneficial insects; or under-application, which may lead to poor pest and disease control and reduced crop protection.

Tractor drawn mist blower

2.8. Weed control

Weed control is a critical aspect of orchard management as weeds compete with fruit trees for essential resources such as water and nutrients, which can reduce tree growth, fruit yield and overall orchard productivity.

Key control methods include cultural practices such as mulching and cover cropping, which suppress weed growth while improving soil health. Mechanical control, like mowing or cultivation, is commonly used between tree rows to manage weed height and prevent seed spread. Chemical control using herbicides is widely practiced, especially for managing weeds within the tree row, but must be applied carefully to avoid damaging trees or beneficial organisms.

2.9. Hydroponic production systems

Hydroponic production systems are commonly used in the commercial production of blueberries in South Africa. These systems involve growing blueberry plants in a soilless medium, such as coconut coir, peat, or perlite, often within containers or grow bags, with nutrients delivered directly to the roots through the irrigation water.

Key advantages of hydroponic systems include the precise control of nutrients and water; reduced soil-borne diseases and pests and improved water use efficiency.

Key disadvantages of hydroponic systems include the high initial setup costs and high level of technical knowledge and close monitoring to manage nutrient levels, pH and irrigation correctly.

Blueberries in a hydroponic system

CHAPTER FOUR

Quality management and compliance

1. What is quality management?

Delivering fruit which meets customers quality standards and expectations is vital to success in the fresh produce industry.

All role-players in the fresh fruit trade chain, including farms, packhouses, container depots, cold stores, transporters and terminals have a role to play to ensure that produce quality meets the required standards and that fruit condition is preserved. With the increase in exports of fruit from other countries consumers can choose products on the supermarket shelf from any country in the world and quality is therefore key to remaining competitive in a global market.

Quality Assurance (QA) is the continual process of detecting and reducing or eliminating errors in the value chain to ensure that fruit meets the customers specifications through to the end of shelf life.

Quality Control (QC) is a tool within quality assurance systems whereby products are inspected and tested to ensure they meet the specified standards and requirements.

A good quality management system is proactive not reactive as the goal is to avoid problems that will negatively impact quality before they occur, rather than identifying quality problems after they have occurred.

It is important to note that fruit quality or condition cannot be improved after harvest. Fruit is at its best the moment of harvest, thereafter the goal is to preserve the fruits condition as long as possible. Similarly, quality issues that originate in the orchard cannot typically be rectified in a packhouse – to use an analogy, a packhouse is not a hospital that can make sick fruit better.

2. Quality Standards

There are two primary sources of quality standards in the South African fruit export industry.

- Minimum statutory quality standards set by the Department of Agriculture (DoA)
- Customer quality standards

Department of Agriculture minimum quality standards

The South African Department of Agriculture (DoA) has set minimum quality standards, specific to each type of fruit, for export. Fruit cannot be exported from South Africa unless it meets these minimum quality standards. The DoA has assigned the Perishable Products Export Control Board (PPECB) to inspect all fruit prior to export against these minimum standards and fruit cannot be exported unless it is passed by the PPECB. This ensures that that South Africa has a good reputation as a global fruit supplier.

Customer quality standards

Most retailers and many other customers have their own fruit quality standards which may often be stricter than the DoA's minimum quality standards. It is therefore vital when packing fruit that fruit is packed according to each customer's quality standards/specifications.

3. What is fruit quality?

It is important to understand that fruit quality is not an absolute concept. Each market and customer has specific quality standards, and fruit can only be considered good or poor relative to these expectations. What one customer regards as good quality may not be viewed the same way by another. This variation is partly due to differing market preferences - for example, one market may prefer larger or less acidic fruit than another - but it is also closely tied to price. Consumers with higher disposable incomes are generally willing to pay more for premium-quality fruit, while those with lower incomes may opt for more affordable, lower-quality options.

Fruit quality attributes can be divided into two main categories:

External quality - what the fruit looks and feels like from the outside, for example;

- Colour
- Size
- Shape
- Blemishes
- Bruising
- Firmness

Internal quality - determines the eating quality of the fruit and includes factors such as:

- Sugar content
- Acidity
- Juice content
- Internal colour
- Flesh firmness
- Texture

Most of the above quality attributes can be measured. In the following chapter on harvesting and packing, we will cover the tools and methodologies used to measure the above quality attributes.

External quality is important because consumers buy with their eyes – they will not pick the fruit up from the shelf if it does not look suitably attractive. However, **internal quality** is equally important as consumers expect fruit to taste good and have a good eating experience. If they do not have a good eating experience, they are unlikely to buy the same fruit again or they may not buy from that store again if they repeatedly buy fruit that does not taste good.

In addition to the above fruit quality attributes, **the way the fruit is packed and palletised** and the **quality of the packaging material** used also has a direct influence on the overall product quality.

4. What is “packout”?

When fruit is graded in a packhouse, it is separated into the different quality grades such as class 1, class 2, local and juice grade. The percentage of fruit which falls into each of these respective grades is referred to as the “packout”. It is very important for growers that their class 1 or export grade packout is maximised to maximise their income. Packhouses therefore have a dual responsibility, which results in competing needs, to maximise the packout, while ensuring that fruit meets customer specifications. If packhouses grade too strictly, they will achieve a lower packout to the detriment of the grower. If they pack too leniently, they will not meet customer specifications to the detriment of the customer.

5. Quality control inspections

There are multiple fruit quality control inspections in the fresh produce value chain. The key inspection points are listed in the table below.

FRUIT QUALITY CONTROL INSPECTION POINTS

INSPECTION POINT	DESCRIPTION
Raw material intake QC	When produce is delivered to a packhouse, an intake QC is done. The inspector will estimate the packout and will list the incidence of key defects. This is used to guide the marketing and packing team as to which markets the product is suitable for and informs the grower regarding the quality of the produce delivered.
In-line QC	Quality inspectors conduct various quality inspections on the pack-line to ensure that packouts are maximised and that fruit is being packed according to specifications.
Packed product QC inspection	Once the fruit is packed, QC inspectors conduct a final QC inspection to ensure that the fruit meets the customer specifications.
PPECB inspection	Once the fruit is packed, PPECB will also inspect the fruit to ensure it meets the minimum DoA quality specifications in which case it is passed for export.
Customer QC inspection	When the fruit arrives at the customer, they or their appointed agent, will conduct a QC inspection to determine whether the fruit meets their quality specifications. If the fruit does not meet their quality specifications, they will either issue a claim to the extent that the fruit does not meet the specifications, or they will reject the fruit.

Quality inspectors make use of **sampling procedures**, which stipulate the size of the sample and the number of different crates, bins or cartons which the sample is taken from to ensure that the sample is representative of the batch.

6. Claims

When a customer receives fruit, if some or all the fruit does not meet their quality specifications, they will calculate the extent to which the fruit does not meet their standards and issue a claim reducing the amount they will pay for the consignment. In such instances, the key options available to the exporter for the rejected fruit is either to regrade and repack the fruit if such facilities are available and are cost effective, or to redirect the fruit to another customer or market which will accept the lower quality. If neither of these

options are possible the fruit will be dumped resulting in a total loss of income, while all the costs in the value chain up to that point still need to be paid resulting in a negative return to the grower.

Exporters should follow a claims procedure when a claim is received to determine the validity of the claim, the origin of the problem, to decide what to do with the affected fruit and to implement preventative measures where relevant.

- Check the temperature loggers to ascertain if the correct temperature was maintained throughout shipping. If there was a temperature issue, a claim can be lodged against marine insurance.

- Check the customer QC against the intake and final packhouse QC. If the customer QC reflects quality issues which bear no resemblance to the intake or packers final QC, follow up is needed as the customer QC may not be accurate. This could be due to issues such as sampling error or in some cases unscrupulous buyers may fabricate quality issues to reduce the price. Customer QC claims should be accompanied by photographs of the affected produce, and these should be requested if not received.

- If there is doubt over the accuracy of the customer QC report, there are a few options available including requesting the customer to reinspect the fruit, sending your own technical staff to reinspect with the customer or sending a third-party surveyor to conduct an inspection.

- Once the validity and accuracy of the customer QC claim has been ascertained, the claims data is captured on the system.

- The claims report is shared with the grower including the photographs.

- If relevant, corrective measures should be implemented on the farm, packhouse etc. to avoid a recurrence

- If the customer rejects some or all the fruit the affected fruit is typically regraded an/or diverted to an alternative customer or market where possible.

Note that growers remain liable for most quality claims as quality issues often originate on the farm. Quality issues picked up on arrival at a customer are often contractually referred to as latent defects as the quality issues were not visible at the time of packing but developed in transit. There are instances where the grower is not liable for the quality claim when it is clear the quality issue did not originate on farm, for example when there was a temperature issue in transit.

7. What is food safety?

Sometimes fruit can become contaminated and if it is eaten it can make a person ill or harm them.

Common food safety hazards in fresh fruit produce include:

- polluted irrigation water,
- incorrect use of chemicals on farms,
- unhygienic practices on farms or in packhouses and
- physical contaminants such as glass or jewellery.

Food safety systems, protocols and audits are important to guard against food safety hazards.

Chemical hazards

Chemical hazards are one of the most important potential hazards found on farms. Chemicals are used on farms to control pests, diseases and weeds. Once chemicals are used, a chemical residue remains in or on the fruit, which may be a hazard to consumers unless strict agricultural practices are followed by the farmer.

For fruit to be safe to eat there are regulations that specify which chemicals may be used, what the correct dosage is, the minimum number of days between chemical application and harvesting (known as the withholding period or post-harvest interval) and how much chemical residue may be left on the fruit. This amount of chemical residue which permitted on or in the fruit is called the **Maximum Residue Level (MRL)** and it is set for each type of chemical and each type of fruit.

Chemical sprayer

Each country, or group of countries such as the European Union, has its own legislated list of chemicals which are allowed, with MRLs per fruit type. It is the role of the exporter to know what these regulations are and to ensure that product they ship is sourced from farms and orchards which have applied the correct chemicals and protocols.

Random residue tests are conducted in receiving countries and if banned chemicals are found or a MRL is exceeded, the consignment will be rejected and destroyed.
There is increasing global concern on the environmental and health risks of chemicals and the list of banned or restricted chemicals is growing on an annual basis.

Polluted irrigation water

The most common contaminant of irrigation water are faecal coliforms of which e-coli is a sub-group. It is important for growers to test irrigation water to ensure that is safe to use. Fortunately, in the fruit industry the risk of contaminated water is greatly reduced as the water from drip irrigation and micro-jet sprinklers does not come into direct contact with the fruit.

Unhygienic practices on farms and in packhouses

Poor hygiene practices such as a lack of suitable hand wash facilities, poorly enforced hand wash protocols or dirty bins and equipment can lead to fruit being contaminated with communicable diseases such as cholera or salmonella and other hazardous contaminants.

Physical contaminants

There are many physical contaminants which can find their way into produce on the farm or in the packhouse. Good systems and protocols are important to mitigate this risk. Examples include rules ensuring that packhouse workers do not wear jewellery and ensuring that all light fittings have screens to avoid glass from broken light bulbs falling into the produce. Other examples of physical contaminants include screws and nuts from packing equipment or strapping buckles. Some packlines are equipped with metal detectors to pick up any contamination with metallic items.

8. Phytosanitary regulations

What are phytosanitary regulations?

Phytosanitary regulations are crucial in maintaining the health and sustainability of the global fruit trade. These regulations are designed to prevent the introduction and spread of harmful pests and diseases between countries that can devastate crops, damage ecosystems, and disrupt trade. Phytosanitary measures serve as both a safeguard for domestic agriculture and help ensure that fruit exported from one country to another meet strict safety standards, protecting consumer health and supporting agricultural biosecurity. Compliance with importing countries' phytosanitary requirements is essential for market access, and any breach can result in shipment rejections, bans, or increased scrutiny.

Who is responsible for the oversight and implementation of phytosanitary regulations?

The development and oversight of phytosanitary regulations involve several international and national players. At the global level, the **International Plant Protection Convention (IPPC)**, under the auspices of the Food and Agriculture Organization (FAO), sets the benchmark standards for plant health. These standards are recognised by the World Trade Organization (WTO) under the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), which provides the legal framework to ensure that phytosanitary measures are scientifically justified and not used as disguised trade barriers. **National Plant Protection Organizations (NPPOs)**, such as South Africa's **Department of Agriculture (DoA)**, are responsible for implementing and enforcing these standards at the domestic level, including issuing phytosanitary certificates for exports and conducting inspections and surveillance programs.

What systems are used to administer phytosanitary regulations in South Africa?

In instances where importing countries identify specific pests or diseases which they deem to pose a significant risk to their own agricultural industry, they will require that specific protocols are followed to mitigate the risk. These pests are referred to as **quarantine pests**. A quarantine pest is a pest (such as an insect, fungus, virus, weed, or other organism) that has potential economic or environmental importance and is either not yet present in an area or is present but not widely distributed and under official control. The enforcement of these protocols is administered by Department of Agriculture (DoA) and these markets are referred to as **special markets**. Certain markets require pre-export registration of farms, packhouses, and treatment facilities, which are audited to ensure compliance. This registration process is administered by an online platform called **PhytClean**. Further to this, every consignment of fruit exported from South Africa requires a phytosanitary certificate confirming that the consignment meets the phytosanitary requirements of the importing country. **Phytosanitary certificates** are issued by the DoA through a paperless system called **eCert** and the digital certificate is called an **ePhyto**. Starting in 2026, digital phytosanitary certificates will be issued by the PPECB on behalf of the DoA.

What are some of the common phytosanitary protocols?

Special markets require special protocols to be implemented which include any of the following:

- **Cold treatment** - Cold treatment (also known in the industry as cold sterilisation or steri) is a phytosanitary protocol used to eliminate or suppress certain insect pests to ensure that fruit shipments are pest-free and meet the phytosanitary requirements of importing countries. The methodology involves exposing the fruit to a specific low temperature for a prescribed duration, such as $0^{o}C$ for 14 days. More detail on cold treatment protocols will be provided in Chapter 6 of this handbook - cold storage and the cold chain.
- **Fumigation** and **irradiation** are alternative means of eliminating phytosanitary pests but are less common than cold treatment.
- **Systems approach** - The systems approach is a comprehensive method for managing phytosanitary risks by integrating multiple pest control and mitigation measures throughout the production and export process. Instead of relying on a single treatment, such as fumigation or cold treatment. It combines a series of independent, scientifically validated steps - such as pest monitoring, field sanitation, host resistance, pre-harvest treatments, and post-harvest inspections - to collectively reduce the risk of pest infestation to an acceptable level.

What are some of the common phytosanitary pests in South Africa?

In the South African fruit export industry, several key phytosanitary pests and diseases are closely monitored due to their potential to affect market access. Some of the most common include:

False codling moth (FCM) – This is one of the most significant phytosanitary pests for South African exports, particularly affecting citrus, stone fruit and pomegranates.

False codling moth

Citrus black spot (CBS) – A fungal disease that affects citrus fruits, especially oranges and lemons. It is a quarantine concern for markets such as the EU and the USA, which requires proof that fruit comes from pest-free areas or has undergone suitable mitigation measures.

Citrus black spot

Mediterranean fruit fly – A highly invasive pest that infests a wide range of fruit crops including citrus, deciduous fruit (such as apples, pears and peaches), and table grapes.

Mediterranean fruit fly

Bactrocera dorsalis fruit fly – Although not widespread in South Africa, its presence in certain regions is a concern. It affects a wide variety of fruits including mangoes, citrus and guavas and strict monitoring is required to maintain pest-free status.

Fruit fly larvae

9. Traceability and tracking

Traceability means being able to trace fresh produce back to the original place where it was grown and packed. The purpose of doing this is to be able to identify the source of a food safety problem. A good traceability system can link a food safety problem to a specific country, packhouse and producer orchard or vineyard.

This is important for several reasons:

- The problem can be linked to one specific producer rather than the whole group;
- It is a fast and accurate way to get to the source of the problem, which limits the risk;
- It limits unnecessary costs; and
- It limits public concerns and fears.

Tracking refers to continuously monitoring the location of fruit in the chain en route to the market.

There are several tools used in the industry which all play and important role in traceability and tracking including:

- Food Business Operator (FBO) codes – A FBO code is a unique registration number assigned by the Department of Agriculture to a business involved in the production, packing, storing, transporting or export of food products - particularly fresh produce like fruit. Two of the most important FBO codes in the fruit industry are the Producer Unit Code (PUC), which is a unique code allocated to each farm which produces fruit for the export market and the Packhouse Code (PHC), which is a unique code allocated to each packhouse which packs for the export market.
- Pallet Identification Barcode – Each pallet of fruit for export is labelled with a 18-digit pallet identification barcode which plays a very important role in traceability and packing. These barcodes are scanned each time the pallet moves from one location to another, for example from a cold store to a shipping container to track its location.

Pallet ID Barcode

- Radio Identification Tags (RFID Tags) - A RFID tag is a small electronic device that uses radio waves to wirelessly transmit data for identifying and tracking objects. This can used instead of a pallet identification bar code to track the location of a pallet without having to use a hand scanner.
- Container number – Each shipping container has a unique container number which is used to track the location of the container.
- Carton labels – Each carton of fruit packed for the export market must have a carton label which meets the minimum legislated requirements including details such as; commodity name, variety name, class, PUC number, PHC number, net quantity and date code (refer to chapter 5 on picking, packing and packaging for further information).
- Pre-pack labels – where fruit is packed in individual pre-packs such as bags or punnets they are often labelled including key traceability information such as PUC number and date code.

10. Customer compliance and accreditation

In addition to growers and exporters having to meet the legislated requirements when exporting, such as meeting the DoA's minimum quality standards and adhering to phytosanitary or traceability legislation, many customers and international retailers have their own compliance requirements.

Customer compliance requirements typically involve certification or accreditation against private standards which can be grouped in three main categories:

- Food safety
- Social/ethical trading (including worker health and safety)
- Environmental

10.1 Cross-cutting accreditation standards

Some compliance standards cover cross cutting issues including food safety, worker health and safety and/or environmental issues. These standards, covered in this section, are primarily Good Agricultural Practice (GAP) standards and are focused on primary production/farming.

GlobalG.A.P certification is a globally recognised benchmark for good agricultural practices that provides assurance of safe and sustainable food production. It is required by many global buyers of fruit from South Africa and as a result most growers who grow for the export market are GlobalG.A.P. certified. For fruit farmers, achieving GlobalG.A.P. certification means aligning their operations with internationally accepted standards for safety, environmental stewardship, and worker welfare. The standard is owned and maintained by Agraya GmbH, a non-profit organisation based in Germany, which acts as the secretariat and custodian of the GlobalG.A.P. standards. It works in collaboration with stakeholders from the entire agricultural value chain, including retailers, producers, and food service companies.

The primary purpose of the GlobalG.A.P. standard is to ensure that food is produced safely, with minimal environmental impact and with due consideration for the health, safety, and welfare of workers and consumers. It is designed to meet the expectations of global markets while helping farmers streamline their practices, improve efficiency, and gain access to international trade opportunities.

To become GlobalG.A.P. compliant, fruit farmers must address several key areas within their production systems. These include traceability of produce, record-keeping and documentation, soil and water management, integrated pest management, responsible fertiliser use and post-harvest handling practices. Farmers must also demonstrate compliance with worker health and safety standards, hygiene protocols, and waste and pollution control measures. GlobalG.A.P accreditation also requires farmers to invest in certain infrastructure such as safe chemical storage facilities and safe fuel storage facilities to protect the environment and worker health and safety and provide access to hygienic toilet and hand wash facilities for workers throughout the farm.

GlobalG.A.P. includes several key measures to safeguard consumers from the risks associated with the use of agro-chemicals on fruit. One of the core requirements is the strict regulation of pesticide use, ensuring that only approved substances are applied and within legally permitted maximum residue limits (MRLs). Farmers must maintain detailed records of all chemical applications, including the type, quantity, timing, and purpose of use. Pre-harvest intervals - the minimum time between the last application and harvest - must be observed to ensure residues degrade to safe levels. Additionally, GlobalG.A.P. requires training for workers handling agro-chemicals to ensure proper use, storage, and disposal.

Regular monitoring, including residue testing and risk assessments, further helps to ensure that the produce reaching consumers is safe and compliant with both local and international food safety standards.

Proper storage of agro-chemicals

Safetly protocols for storage of agro-chemicals

Worker health and safety standards

Regular audits by accredited certification bodies ensure ongoing compliance. By achieving GlobalG.A.P. certification, fruit farmers not only enhance their credibility and marketability but also contribute to a safer, more responsible food supply chain.

CONTROLUNION

GGN/GLN: 4063651501681
CERTIFICATE No: CU 893915-01.2023

PRODUCTS RvA C 412

Announced ☑
Unannounced ☐

GLOBALG.A.P.

CERTIFICATE

GLOBALG.A.P. General Regulations Version 5.2_February2019
Fruit & Vegetables
Option 1 - individual producer

Issued to:

The Annex contains details of the producers and production sites / product handling units included in the scope of this certificate. Control Union Certifications B.V. declares that the production of the products mentioned on this certificate has been found to be compliant in accordance with the standard:

The current status of this certificate is always displayed at: https://www.database.globalgap.org/search

GLOBALG.A.P. Control Points and Compliance Criteria Integrated Farm Assurance Version 5.2_February2019

Products	GLOBALG.A.P. Product Certificate Number	Harvest Excluded	Product Handling	No. of Producers/ Production Sites	Parallel Production	Parallel Ownership
Tomato	00119.FVNPH.0002	No	In field + facility	1	No	No

Declared by Managing Director:

CONTROLUNION
Control Union Certifications B.V.

On behalf of the Managing Director
Poczik, Ms. E (Erika)

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Valid from: 10 March 2023
Valid to: 09 March 2024

Date of certification decision: 10 March 2023
Printed on: 10 March 2023

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An example of a GlobalG.A.P. certificate

Retailer GAP standards

Retailer GAP (Good Agricultural Practices) standards in the fresh produce industry are food safety and quality assurance schemes developed by individual retailers or retail groups to ensure that their suppliers meet specific production and safety requirements. These standards are similar to GlobalG.A.P. in that they cover core areas such as traceability, agro-chemical use, worker safety and environmental protection. However, retailer GAP standards often include stricter or additional requirements tailored to a retailer's brand values, risk appetite, or customer expectations. They exist to provide greater control and assurance over the quality and safety of products sold under a retailer's label, often going beyond baseline compliance to include aspects like ethical trade or carbon footprint reduction.

Tesco Nurture is an example of a retailer G.A.P standard. While many of these standards are aligned with or benchmarked against GlobalGAP, they allow retailers to differentiate themselves in the market by promoting higher standards or sustainability credentials.

10.2 Food safety accreditation standards

Some of the most common food safety accreditation standards are covered below. These standards are primarily applicable to packhouses. Note that while (Hazard Analysis Critical Control Points) HACCP can be done as a stand-alone accreditation it is more typically applied as a methodology within other accreditation standards such as BRCGS and IFS.

Brand Reputation Compliance Global Standard (BRCGS)

BRCGS (Brand Reputation Compliance Global Standards) certification is a globally recognised food safety and quality management standard, particularly important for fruit packers who handle, process, and distribute fresh produce. The standard is owned and managed by BRCGS, a global brand originally developed by the British Retail Consortium, and is now part of LGC Assure. Its primary purpose is to ensure that food is handled, packed, and stored safely and hygienically, while meeting the expectations of retailers, food service companies, and consumers worldwide.

For fruit packers, achieving BRCGS certification involves demonstrating robust food safety management systems, hazard analysis and critical control points (HACCP), and good manufacturing practices (GMP). Key aspects include site hygiene, pest control, traceability systems, temperature management, and allergen control, where relevant. Staff training, documented procedures, and risk assessments are also essential components. The standard requires packhouses to maintain clean, organised facilities, ensure product integrity, and carry out regular internal audits. Certification is granted through an independent audit process and must be renewed periodically.

IFS Food Standard

The IFS Food Standard (International Featured Standards) is a globally recognised certification designed to ensure food safety, quality, and compliance with legal and customer requirements in food processing and handling environments. The standard is managed by IFS Management GmbH, a joint initiative of major European retailers and trade associations, with the aim of creating a unified approach to assessing supplier compliance and reducing the need for multiple audits.

The main purpose of the IFS Food Standard is to promote transparency, consistency, and trust throughout the food supply chain. For fruit packers, becoming IFS certified involves implementing a strong food safety management system, with a focus on hazard analysis and risk assessment (HACCP), good manufacturing

practices (GMP), and product traceability. Key areas of compliance include facility hygiene, foreign body prevention, employee training, and control of allergens and contaminants. The standard also emphasises customer focus, requiring documented procedures and continuous improvement processes. Audits are conducted by accredited bodies, and certification is graded based on performance, encouraging higher standards and accountability.

FSSC 22000

FSSC 22000 (Food Safety System Certification 22000) is a globally recognised food safety certification scheme based on ISO standards, specifically tailored for food manufacturers, including fruit packers. The standard is managed by the Foundation FSSC, a non-profit organisation headquartered in the Netherlands. FSSC 22000 is fully recognised by the Global Food Safety Initiative (GFSI), as is BRCGS and the IFS Food Standard, making it an option for packers looking to meet international food safety requirements and enhance their position in global supply chains.

10.3 Social/Ethical Trading Standards

SIZA Social Standard

The SIZA Social Standard (Sustainability Initiative of South Africa) is a locally developed, internationally recognised ethical trade certification used by South African agricultural exporters to demonstrate compliance with social and labour legislation. The primary purpose of the standard is to promote fair labour practices, safeguard workers' rights, and ensure ethical working conditions across the agricultural value chain. It helps South African producers meet the expectations of global buyers while fostering continuous improvement in social compliance. To be SIZA compliant, farmers must address key areas such as employment conditions, wages and working hours, health and safety, freedom of association, non-discrimination, and protection of vulnerable workers. Compliance is verified through independent audits and supported by a risk-based approach that encourages long-term improvements and accountability within farming operations. The SIZA programme subscribes to an improvement-led rather than an audit-led approach, utilising the SIZA Audit Frequency Matrix. This matrix categorises risks into four levels: Platinum, Gold, Silver, and Bronze, with Platinum having the most stringent criteria and therefore, the longest audit validity period. SIZA members are rated based on audit findings, and continuous improvement is encouraged to achieve higher ratings.

The SIZA audit process includes the following steps:

- Step 1: Compliance and Awareness Training
- Step 2: Registration and Annual Completion of Self-Assessment Questionnaire (SAQ)
- Step 3: Audit Preparation and Raising Awareness among Employees
- Step 4: Third-party Audit
- Step 5: Corrective Actions supported by Remedy programmes
- Step 6: Audit Completion Letter Issued
- Step 7: Maintaining Compliance and driving Continuous Improvement through Audit Oversight principles between the audit periods.

SEDEX

SEDEX stands for Supplier Ethical Data Exchange. It is a global membership organisation that helps companies manage and improve their ethical and responsible business practices in global supply chains. Key goals of SEDEX include enabling businesses to share ethical data with customers and buyers, manage and reduce risk in supply chains, Improve labour conditions, health & safety, environmental performance, and business ethics. Many UK retailers require suppliers to have SEDEX membership, which requires suppliers to enter their social compliance data on the SEDEX database. In the case of South African suppliers, the

data entered into the SEDEX database is sourced from the suppliers latest SIZA Social audit together with the annual SIZA self-assessment questionnaire (SAQ).

Fair Trade

Fair Trade is a global movement and certification system designed to ensure that producers in developing countries receive fair prices for their goods, work in safe conditions, and follow environmentally sustainable practices. The most recognised certification is managed by Fairtrade International (FLO), which sets the standards and works with local producer organisations, traders, and certifiers (like FLOCERT) to uphold them. The aim of Fair Trade is to promote equity in international trade, empower smallholder farmers and workers, and reduce poverty through ethical purchasing and sustainable farming.

The scheme works by guaranteeing a minimum price for products regardless of market fluctuations, and by providing a Fairtrade Premium: additional funds that farmer cooperatives or worker associations can invest in community development projects like education, healthcare, or infrastructure. Products carrying the Fairtrade mark must be traceable and sourced from certified supply chains. Participation in the Fair Trade scheme is voluntary.

10.4 Environmental Standards

Compliance with food safety and social standards has long been a requirement by many international retailers. Similarly, there is mounting pressure for growers to start complying with various environmental standards.

SIZA Environmental Standard

The SIZA Environmental Standard is part of the Sustainability Initiative of South Africa and is designed to promote environmentally responsible farming practices within the South African agricultural sector. The purpose of the standard is to ensure that farms operate in a way that conserves natural resources, reduces environmental impact, and aligns with both local regulations and international sustainability expectations. It provides a framework for continuous improvement in environmental management, helping producers meet buyer requirements and improve their long-term resilience. To become certified, farmers must conduct a self-assessment and undergo a third-party audit to demonstrate compliance in areas such as water and soil management, waste disposal, chemical use, energy efficiency, and biodiversity conservation. They must also develop and implement an Environmental Management Plan (EMP) that outlines how they will minimise their environmental footprint and improve over time. The SIZA environmental programme supports farmers with training, resources, and a risk-based approach to encourage ongoing progress and responsible stewardship of natural resources.

In additional to the SIZA Environmental Standard, as part of SIZA's drive towards continuous improvement, the SIZA CARES programme has been implemented to manage environmental risks within the agricultural sector. With the vision of enabling South African agriculture to be a global leader in sustainability and environmental stewardship, the programme was developed with the purpose to Create Awareness and Resilience in Environmental Sustainability. The aim of the SIZA CARES programme is to improve the quality of data submitted on Environmental Self-Assessment Questionnaires (SAQs) and to drive meaningful, continuous, and sustainable improvement based on site-specific recommendations. During the SIZA CARES verification, the Environmental SAQ of the SIZA member will be verified and technical advisory services will be provided to suppliers/packhouses on the identified areas of improvement. SIZA CARES forms part of SIZA's second-party between audit monitoring programme through which SIZA monitors compliance with the SIZA Environmental standard between audit periods.

LEAF Marque

LEAF Marque is a globally recognised environmental assurance system developed by LEAF (Linking Environment and Farming) in the UK. It certifies farms that operate according to the principles of Integrated Farm Management (IFM) - a holistic approach that balances efficient, high-quality food production with environmental care. The LEAF Marque logo on fresh produce assures consumers and retailers that the product has been grown sustainably, with consideration for soil health, water conservation, biodiversity, energy use, and community engagement.

To be LEAF Marque compliant, growers must implement and maintain a comprehensive Integrated Farm Management system. This includes practices such as soil and nutrient management, pest and disease control using minimal chemicals, efficient water use, waste management, and enhancement of wildlife habitats on the farm. Farmers are also required to maintain thorough records, participate in regular audits by independent certification bodies, and continually strive for improvement through training and the adoption of new techniques. In addition, LEAF places a strong emphasis on public engagement, encouraging farmers to open their farms to visitors and share knowledge about sustainable agriculture.

Several major UK retailers now require LEAF Marque certification for imported produce. Retailers such as Waitrose, Marks & Spencer (M&S) and Tesco have integrated LEAF Marque into their sourcing standards to ensure their suppliers meet high environmental benchmarks.
The SIZA Environmental audit can be performed with a LEAF Marque "bolt-on" (which covers additional requirements unique to the LEAF Marque standard).

Rainforest Alliance

The Rainforest Alliance (RFA) accreditation is an internationally recognised certification that promotes sustainable agriculture by setting rigorous environmental, social, and economic standards for farming and supply chains. For fruit exporters, RFA accreditation signals to global buyers that their produce is grown using responsible practices - such as protecting biodiversity, conserving natural resources, ensuring fair treatment and safe working conditions for farm workers, and promoting climate resilience. Many international retailers and importers prefer or require RFA-certified products, making the accreditation a valuable market access tool that can enhance brand reputation, meet sustainability commitments, and strengthen competitiveness in increasingly eco-conscious markets.

European Green Deal

The European Green Deal is the European Union's comprehensive strategy to achieve climate neutrality by 2050. Central to this initiative is the Farm to Fork Strategy, which aims to make food systems more sustainable with targets of reducing pesticide use by 50%, converting 25% of farmland to organic agriculture, and minimising environmental impacts throughout the food supply chain. While these policies currently primarily target EU producers, they are increasingly likely to extend to imported produce in future.

10.5 Organic Certification

Organic production is an overall system of farm management and food production that preserves traceability and combines best environmental and climate action practices, a high level of biodiversity, the preservation of natural resources and high production standards using natural substances and processes. The use of synthetic chemicals and fertiliser is therefore not allowed. Considering this, certification bodies offer a service confirming the compliance of inputs with requested organic agriculture standards through either input document review or input attestation. The most common certification standards among South African organic fruit producers for export markets are the EU Organic Regulation for European markets and USDA National Organic Programme (NOP) for the American market.

Certification to these standards is conducted by approved third-party certifiers such as Ecocert, Control Union, or CERES, which conduct annual inspections and audits of farms and processing facilities.

CHAPTER FIVE

Picking, packing and packaging

Correctly packed fruit on its way to market

Picking, packing procedures and packaging all play a very important part in maintaining the condition of fresh fruit on its way to the market and the consumer.

1. Picking

To maintain fruit condition, both the timing of harvest and the handling of the fruit during picking are critically important.

1.1 Fruit maturity and planning when to pick fruit

Different fruit types mature and become ready to pick at different times of the year. Before fruit is ripe or mature it is firm, it does not have much flavour, and it often has high acid levels and low sugar levels which make it sour. As the fruit ripens, both the external and internal elements of the fruit improve. It is very important to pick fruit at the right level of maturity because this affects its taste, appearance, general quality and overall shelf life.

When is a fruit mature and ready to be picked?

Fruit is said to be mature/ripe and ready to be picked when it reaches its optimum or best quality level in terms of its taste, texture, appearance and storage potential.

Climacteric and non-climacteric fruit

Some fruit like table grapes, citrus, litchis and blueberries are called **non-climacteric** fruit types. This means that the ripening process stops as soon as the fruit has been picked. Such fruit must be picked at the correct stage of maturity as it will not ripen further following harvest.

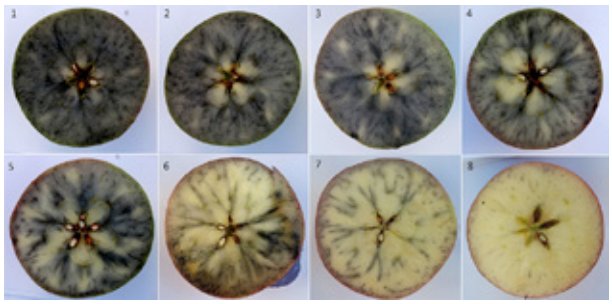
Other fruit, like stone fruit, pome fruit, avocados and mangoes, are called **climacteric** fruit. They continue to ripen or mature after they have been picked. Climacteric fruits can be picked before they are mature to extend shelf life as they will continue to ripen following harvest.

Testing for fruit maturity

Fruit maturity is determined using a combination of external factors (like skin colour), and internal factors (like acid, sugar or starch levels and softness of the fruit). The process of deciding when fruit is ready to be picked is called **maturity indexing**.

There are various methods of measuring fruit maturity and each fruit type has one or more measurements which are primarily used in the process of maturity indexing. The process for all fruit types involves picking samples of fruit for testing. The first samples are typically drawn three to four weeks before the fruit is expected to be mature. Sampling continues each week until the fruit is ready for harvesting either based on the DoA's minimum standards or customer standards.

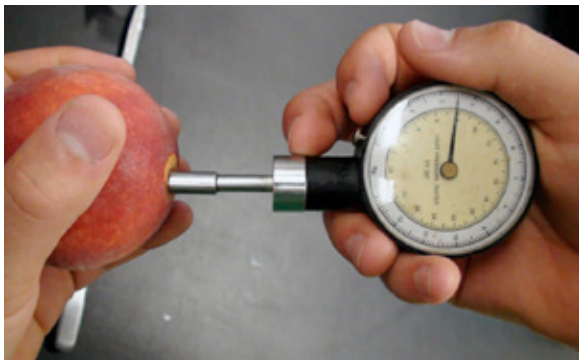
A sample typically consists of fruits picked from different marked trees/vines spread throughout the orchard (in citrus 25 fruits picked from 10 different treas). In citrus, the external colour, sugar content and acidity are key measurements used in maturity indexing and the juice content is also measured. In apples, the extent to which starch in the fruit has converted to sugar is one of the primary measures used for maturity indexing. Sugar content, acidity and the firmness of apples are also measured. In table grapes the sugar and acid content are primarily used, while in avocadoes the solid matter content is measured. In mangoes the internal flesh colour is the primary measure used for maturity. In stone fruit the sugar level, acidity and firmness are measured.



Starch iodine test illustrated

The starch content of apples is measured by the starch iodine test. An apple is cut in half, and the cut side is dipped in an iodine solution. The percentage of black colour on the fruit indicates the amount of starch in the fruit.

With stone and pome fruit, the flesh of the fruit gets soft as the fruit ripens, so a pressure reading in kg's is taken with a penetrometer to see how soft the inside of the fruit is.



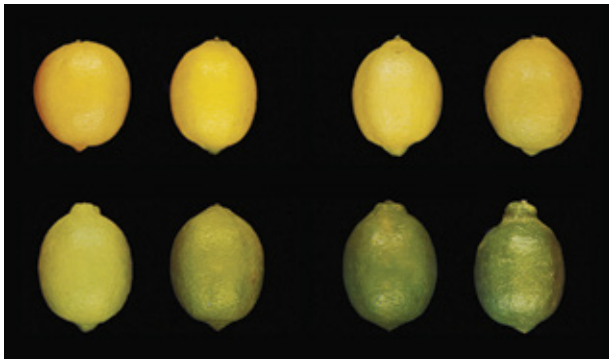
A penetrometer in use

A refractometer being used to measure sugar content in grapes

A refractometer is used to measure the sugar content of fruit. The above example is a digital refractometer. Sugar content is measure in degrees brix or % Total Soluble Solids (TSS)

Acidity is measured using titration or a digital pH meter and is expressed as a percentage

A digital pH meter



Colour charts used to measure external colour

Colour charts such as the adjacent example for lemons are used to measure external colour

Pome fruit maturity indexing

As explained above, pome fruit are climacteric fruit, which continue ripening after harvest. The process of deciding when to pick the fruit is therefore more complex than for non-climacteric fruit. The guiding principles in maturity indexing for pome fruit are explained below to serve as an example for climacteric fruit.

The **release date** is the earliest point at which harvest can start when fruit has reached physiological maturity and will continue to ripen after harvest.

Pome fruit harvesting is divided into 3 periods or **picking windows** (called pre-optimum, optimum and post-optimum) which span a total of about 15 days in pears and 20 days in apples. A key factor in determining which window to pick the fruit in is the length of time the fruit will be stored and the transit time to the target market.

Fruit harvested during the **pre-optimum** window (typically the first 3 to 4 days after the release date) has good storage potential but acceptable taste will only develop during and after storage. The risk of superficial scald and bitter pit development is higher during this period.

Fruit harvested during the **optimum** window (middle period of 7 to 10 days) is best suited for medium to long storage and has good taste.

Fruit harvested during the **post-optimum** window has short storage potential but superior taste and is best suited for fruit sold on the local market, which will not be stored for a long period prior to consumption. Fruit harvested over mature in this period has potential for over maturity defects such as greasiness, mealiness, internal breakdown and decay.

External colour

There are various factors that influence the colour of fruit, including exposure to sunlight, nitrogen in the soil, temperature and water. The colour of citrus fruit can be developed while it is on the tree by applying an Ethapon treatment to stimulate the development of internal ethylene, or after the fruit has been picked, through a degreening process. The degreening process involves storing fruit, immediately after it has been picked, in degreening rooms where the temperature, humidity and CO^2 levels are carefully controlled and ethylene gas is introduced to help the process.

Strip picking versus selective picking

Growers have two main harvesting options: strip picking or selective picking. **Strip picking** involves harvesting the entire orchard in a single pass, which increases labour efficiency and reduces harvesting costs. However, this method results in greater variability in fruit quality attributes such as colour.

In contrast, **selective picking** is carried out over multiple passes, allowing harvesters to pick only the fruit that has reached optimal maturity. For example, in orchards of red apples where a premium is paid for well-coloured fruit, growers may choose selective picking to maximise colour development and overall fruit value.

1.2 Picking equipment

There are certain standards that must be met during picking that apply to fruit condition and food safety. For both these reasons it is important that the correct equipment is used when picking and that the equipment is regularly cleaned and well maintained. Pickers should receive training in hygiene, in using the equipment and in picking methods before harvesting begins each season.

Picking bags for picking fruit with a thin, soft skin (eg. apricots).

Lugs being used in a table grape vineyard.

Picking bags, baskets and lugs

Depending on the type of fruit being picked, pickers place the fruit into a bag, basket or lug (plastic crate). Bags should be made of a soft material and baskets can be lined with a protective material like foam rubber to prevent damage or bruising. Lugs/crates are used for table grapes, most varieties of avocados and sometimes stone fruit.

Ladders used for picking

Ladders (for tree fruits)

Ladders must be tall enough to pick fruit from the top branches of trees and light enough to be carried and not cause damage to trees or fruit.

Trimming shears being used to harvest grapes

Clippers/trimming shears

Some fruit types, like apples and pears, are picked by hand. Table grapes are cut with trimming shears and clippers are sometimes used for citrus and subtropical fruits.

Fruit is tipped from a picking bag into a fruit bin

Fruit bins and trailers

Once a picking bag or basket has been filled, the fruit is tipped into a fruit bin or lug made of plastic or wood, for transport to the pack house. Note that sensitive crops such as table grapes and blueberries are picked and transported in lugs/crates.

Gloves being used to handle sensitive fruit

Gloves and protective clothing

Gloves are used to pick certain sensitive kinds of fruit.

1.3 Handling and picking fruit

Fruit should be picked in the way that causes it the least damage. Fruit is either picked by hand by twisting or snapping the stem or clipped from the tree or vine. If fruit falls onto the ground while picking is taking place, it must be left there.

Transferring the fruit into trailers and trucks

Bags, lugs or bins of picked fruit should be kept in the shade while waiting to be transferred to the trailer or truck to avoid sunburn and reduced shelf life. When bags or baskets are emptied into a bin or trailer, they should not be held too high, and the fruit should be smoothly rolled out of the bag or basket.

Left: Gentle handling of fruit is very important during picking. Centre: Gloves are used to pick certain sensitive kinds of fruit.
Right: Once fruit has been picked, it should be gently rolled into the trailer.

Hygiene

Good hygiene practices protect both people and the fruit. Pickers should always wear protective clothing, and their nails should be clean and cut short. Any equipment that is used in picking should be regularly disinfected and cleaned at the end of each harvesting day. Toilets with hand washing facilities must be accessible to pickers close to the orchard.

1.4 Picking teams

The farmer needs to work out well in advance how many pickers will be needed to harvest the fruit in the required time. There are several factors that impact on the time available for picking and therefore the number of pickers needed. For example, fruit should not be picked when it is wet, after rain or early in the morning when there is still dew on the fruit as the fruit needs to dry naturally before being picked.

Picking teams are worked out by the farmer in advance and depend mainly on the fruit yield.

1.5 Transporting fruit from the orchard or vineyard to the pack house

When fruit is transported from the orchard, special care must be taken to protect the fruit. The following measures limit the risk of bruising during transit from the orchard:

- Farm roads must be graded prior to harvest
- Bin trailer tyres must not be over inflated
- Drivers should drive slowly
- Increasingly, modern bin trailers are designed with suspension

Great care must be taken by the driver when driving fruit back to the pack house.

2. Packing

The packhouse is where fruit is graded and packaged for export. Most types of fruit are processed in large, commercial packhouses that serve multiple growers. This is because the high-tech equipment used in modern facilities is costly to purchase and operate requiring sufficient economies of scale to be viable.

An exception are table grapes, which are typically packed by the growers themselves. In this case, the packing process is mostly manual and takes place on the farm.

In this handbook, we will cover the process flow of a citrus and apple packhouse to serve as examples.

Forklift working in packhouse

2.1 Citrus packhouse flow

The typical flow of fruit in a citrus packhouse is illustrated below.

DIAGRAM ILLUSTRATING THE TYPICAL FLOW IN A CITRUS PACKHOUSE

1. Receiving and weighing

The bins of citrus are weighed upon receival from the farm.

2. Degreening

If the packhouse has degreening rooms and the fruit will benefit from degreening, the fruit will pass through a fungicide drench and thereafter be placed in a degreening room prior to grading and packing to facilitate better and more even colour development.

3. Wet/Dry dump

At the start of the grading and packing process the fruit is tipped onto the pack line either onto a conveyor belt called a “dry dump” or into a water flume called a “wet dump” prior to which each bin is weighed again.

4. Wash

The fruit is washed on the packline in a washer with high pressure water nozzles and brushes.

5. Pre-sort
After washing the fruit passes over a conveyor belt where the fruit is manually sorted to remove juice grade and reject fruit.


Pre-sort

6. Hot water fungicide bath
The fruit passes through a hot water fungicide bath to mitigate against the incidence of post-harvest fungal growth.

7. Drying tunnel
The fruit passes through a drying tunnel to dry the fruit prior to waxing

8. Waxing
The fruit passes through a waxing tunnel where edible food grade wax is sprayed into the fruit which limits moisture loss, guards against fungal infection and gives the fruit a nice glossy appearance.


Waxing

9. Drying tunnel
After waxing the fruit passes through a second drying tunnel to dry the wax.

10. Optical grading and sizing
The fruits are separated into single lines using a singulator and then pass under an optical grader and sizer. An optical grader and sizer uses high-speed cameras to capture images of each fruit from multiple angles to assess external quality traits like colour, size, shape, and surface defects. The optical grader is connected to a software programme which can be adjusted by the packhouse to match customer specifications. Following the optical grader the packline uses a cup system to drop the fruit at different points so that the different sizes and grades are grouped together.

Optical grading and sizing

11. Fruit labelling
For some markets, fruit is individually labelled with variety or other branding.


Weighing

12. Packing
The fruit is packed into pre-packs and cartons or loose in cartons according to customer specifications. In some packhouses this is done by hand and on other modern packlines this process is automated. After packing carton labels are applied.

13. Weighing
After packing, pre-packs and/or cartons are weighed to check whether they fall within the specifications. All reject fruit is also weighed to reconcile the tipped weight with the final packed weight. Note that fruit loses weight over time due to moisture loss and the net packed weight of fruit is therefore increased to accommodate for moisture loss.


Palletisation

14. Palletisation
The final step on the packline is palletisation during which the

complete cartons are stacked onto pallets and strapped. This process can either be done by hand or be automated. It is vital that pallets are neatly built to ensure that they are stable for the logistics process. Once the pallets are complete the pallet ID labels are applied.

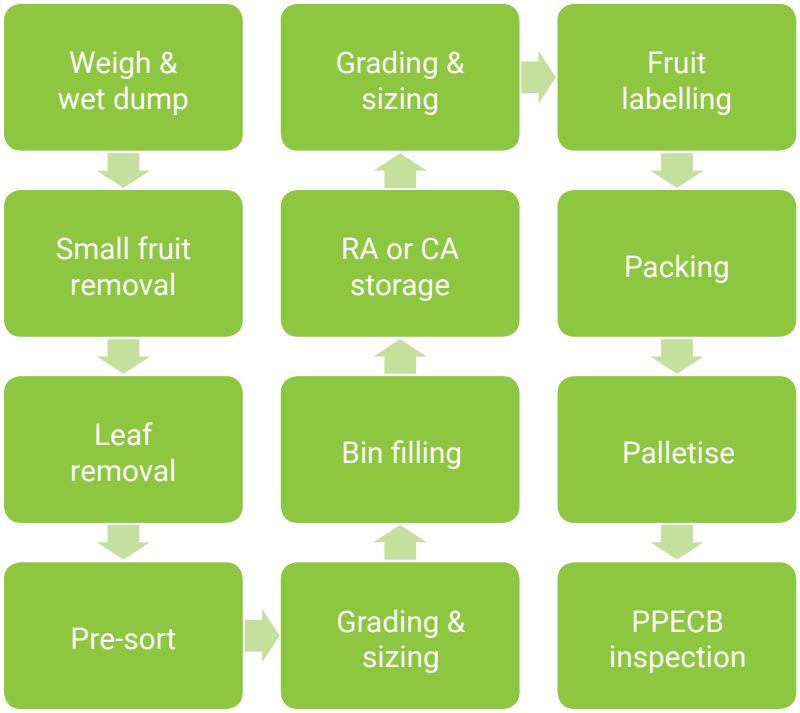
15. PPECB inspection
Following palletisation, the PPECB inspects the products to pass them for export according to the DoA standards. The packhouse will also conduct an in-house QC inspection at this point.

2.2 Pome fruit packhouse flow

Many modern pome fruit packhouses use a pre-grading system whereby all the fruit undergoes a first grading process after which it is placed back in bins for storage, followed by final packing on a separate line as required by the marketing plan. This enables greater flexibility and efficiency in the packing process.

The typical process flow for a pome fruit packhouse with a pre-grading system is illustrated below:

DIAGRAM ILLUSTRATING THE TYPICAL FLOW IN A POME FRUIT PACKHOUSE



1. Weigh and wet dump
Before bins are tipped onto the pack line the bins are weighed. On most modern pome fruit pack lines the fruit is tipped into a water flume called a “wet dump”. Some older pome fruit pack lines do however use a dry dump onto conveyor belts.

2. Small fruit removal
At the start of the pack line a roller system removes the small fruit.

3. Leaf removal
High pressure jets remove leaves and stalks attached to some fruit.


Weigh & wet dump

4. Pre-sort
After washing, the fruit passes over a conveyor belt where the fruit is manually sorted to remove juice grade and reject fruit.


Pre-sort

5. Optical grading and sizing
The fruits are separated into single lines using a singulator and then pass under an optical grader. An optical grader uses high-speed cameras to capture images of each fruit from multiple angles to assess external quality traits like colour, size, shape, and surface defects. The optical grader is connected to a software programme which can be adjusted by the packhouse to match customer specifications. Some optical graders also have infrared cameras and some packhouses have additional scanners that scan the internal quality of the fruit to eliminate conditions such as internal browning and water core. Following the optical grader the pack line uses a cup system which weighs each fruit and then drops the fruit at different points so that the different sizes and grades are grouped together.

6. Bin filling
Following pre-grading the different sizes and grades of fruit are placed back in bins by a bin filler and weighed.

7. Regular atmosphere (RA) or Controlled Atmosphere (CA) storage
If fruit is not packed immediately at this point, it is place in RA or CA storage (refer to cold storage chapter) for storage until it is needed according to the marketing plan.

8. Grading and sizing
When the fruit is ready for packing according to the marketing plan, the pre-graded fruit are placed back on a pack line for final grading and packing. In some instances the fruit passes under an optical grader for a second time to fine tune the grading and then again onto a cup system where it is weighed and separated into the different grades and sizes.

9. Fruit labelling
For some markets, fruit is individually labelled with variety or trade name branding.

10. Packing
The fruit is packed into pre-packs and cartons or loose in cartons according to customer specifications. In some packhouses this is done by hand and on other modern pack lines this process is automated. After packing carton labels are applied.


Packing

11. Weighing
After packing, pre-packs and/or cartons are weighed to check whether they fall within the specifications. All reject fruit is also weighed to reconcile the tipped weight with the final packed weight. Note that fruit loses weight over time due to moisture loss and the net packed weight of fruit is therefore increased to accommodate for moisture loss.

12. Palletisation
The final step on the pack line is palletisation during which the complete cartons are stacked onto pallets and strapped. This process can either be done by hand or be automated. It is vital that pallets are neatly built to ensure that they are stable for the logistics process. Once the pallets are complete the pallet ID labels are applied.

13. PPECB inspection
Following palletisation, the PPECB inspects the products to pass them for export according to the DoA standards. The packhouse will also conduct an in-house QC inspection at this point.

3. Packaging

The main functions of packaging are summarised below.

SIX FUNCTIONS OF PACKAGING

- Containment for shipping
- Protection against contact injuries
- Protection against natural deterioration
- Providing consumer information
- Present the fruit in a neat and attractive way to the consumer
- Promote the product

3.1 Types of packaging

- Packaging can be divided into three categories:
- Internal packaging – e.g. box liners, bags, punnets, trays
- External packaging – e.g. cartons, reusable plastic containers (RPCs)
- Palletisation packaging – e.g. locating sheets, top sheets, corner pieces, strapping

Internal packaging

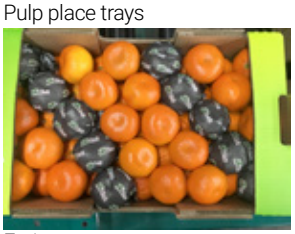
Various types of internal packaging are used to protect the fruit and pack it in smaller units convenient for consumers.

Internal packaging which helps protect the fruit includes:

- Polystyrene or pulp place trays prevent fruit like pome and stone fruit from bruising and present the fruit in an attractive way.

Pulp place trays

- Fruit wrappers help protect the fruit and provide a branding opportunity.



Fruit wrappers

- Plastic liner bags help to retain the moisture in the carton.
- Sulphur dioxide sheets are used in table grape cartons to prevent mould growth.

Plastic liner bags

- Various forms of pre-packs are used to package the fruit in smaller units convenient for consumers including:
- Bags - Many fruit types such as apples, table grapes and avocados are packed in plastic bags.

Smaller packing bags

- Punnets - several fruit types are such as table grapes and blueberries are often packed in plastic punnets.

Punnets

- Flow wrap – Flow wrap is a type of packaging where a continuous film is sealed around the product to form a bag in an automated process.


Flow wrap

- Pulp trays - Pulp trays can serve as a more environmentally friendly alternative to plastic punnets but typically still need to be sealed using a product such as flow wrap.


Pulp tray

External packaging

Cartons

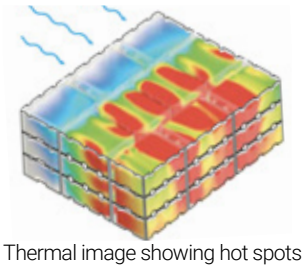
Most fruit cartons are made of corrugated cardboard.
Cartons should comply with the following rules:

- Must be strong enough to carry the weight of the fruit and the weight of the cartons packed above it.
- Must be designed in a way that prevents the fruit from decaying on its way to the market.
- Must have adequate ventilation to facilitate cooling.
- Must have adequate moisture resistance to remain strong in a high humidity cold store environment.
- Should make the fruit look attractive and neat.
- Must have suitable dimensions and design to stack tightly on pallets and remain stable.
- Must meet any specific requirements of buyers.
- Must not be made up using any forbidden chemicals or materials.
- Must be possible to be recycled or composted (to be environmentally friendly).
- Must clearly identify the fruit inside and its origin.
- Must fold and glue easily in carton folding machines.
- Must be cost effective.

Example of damaged packaging

If packaging is not strong enough and is damaged along the trade chain, it will cause damage to the fruit.

Cartons must have proper ventilation holes on the sides, tops and bottoms to allow air to flow freely through the carton for cooling. The image on the right shows the hot spots in a pallet of fruit caused by insufficient ventilation holes in the carton design.


Thermal image showing hot spots

Types of cartons

There are various types of cartons used to pack fruit. The type of carton used is typically dictated by the customer and/or the market preference.
These include:

- Telescopic cartons where the lid slips on over the box.

Telescopic cartons

- Open-top or display cartons that can be placed directly onto display shelves.

- Corrugated bulk bins are used to export processing grade fruit or fruit in bulk for packing in destination markets.


Display cartons

Size and weight of cartons

Cartons typically carry fruit with a weight of between 1.5kg to 18kg depending on the fruit type, customer and market. Carton dimensions are based on the standard size of the pallet so that cartons can be effectively packed onto pallets. Cartons to be packed on standard 1 x 1.2m pallets (white block) typically have a footprint of 300 x 400mm or 400 x 600mm.

Pack type codes

Each type of carton is allocated a pack type code for ease of reference and record keeping. For example, a standard 12.5kg telescopic apple or pear carton is a M12T, while a 15kg telescopic citrus carton is an E15D and a 4.5kg table grape carton is a B04I.

Actual cartons versus standard carton equivalents

For statistical purposes, each fruit type has what is referred to as a standard carton weight which is typically the most common packaging format. For example, for citrus it is 15kg's, apples 12.5kg's, table grapes 4.5kg's and plums 5.25kg's. For statistical purposes, the number of actual cartons is often converted to what is referred to as the number of standard carton equivalents when reporting carton quantities.

Carton design and branding

Cartons can either be plain, such as black and craft cartons, often preferred by retailers to create uniformity on the retail shelves. Alternatively, cartons can be branded carrying the brand of the exporter or variety, often used in wholesale and informal markets where the brand strength and carton design assists in selling the produce.

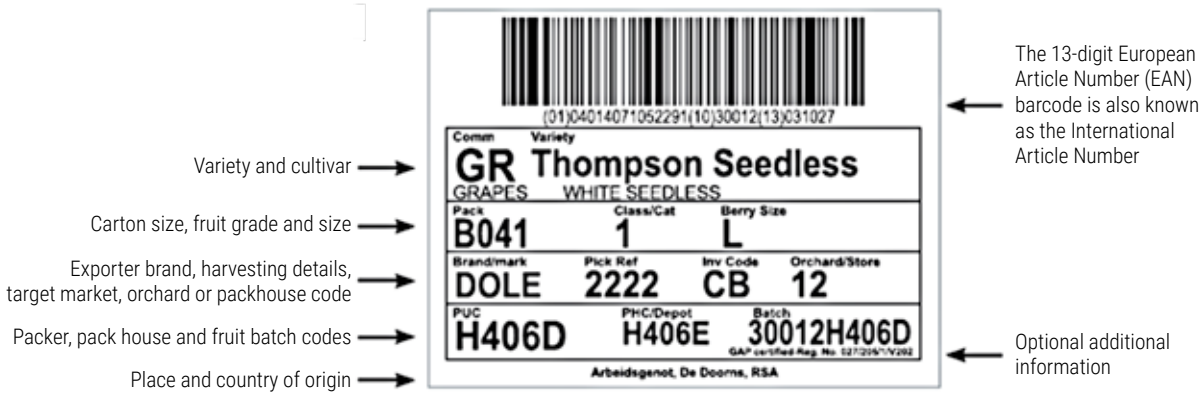
Reusable Plastic Containers (RPCs)

While less commonly used by South African exporters, some retailers prefer to use reusable plastic containers rather than cartons. RPCs are typically either collapsable or inter-stacking when empty so that they take up less space for shipping back to the point of origin for re-use.

Reusable plastic container

3.2 Labelling

BOX END LABEL



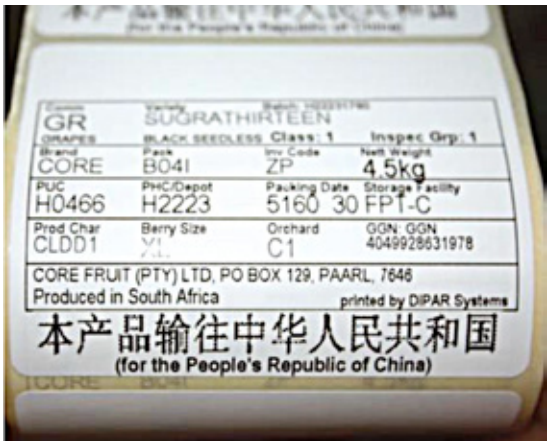
Labelling and traceability requirements

In South Africa, all export cartons must carry certain markings on the packaging of fresh produce. These markings are used to provide the consumer with accurate and relevant information on a product, including information on where it was grown. All box end labels must include the following information:

- Produce of South Africa
- The name and address of the exporter and/or packhouse
- The Producer Unit Code (PUC)
- Packhouse code (PHC)
- The product type
- The variety/cultivar
- The class of the product, for example, Class 1
- The net quantity (count or size) of the product
- A date code

Other optional forms of identification include harvest bin cards and pallet barcode labels.

Some export markets have additional label requirements such as the example for the Chinese market below.



Example of a label for the Chinese market

3.3 Pallets

Pallets provide a strong base for transporting and storing cartons. Cartons are designed in a way to interlock and fit into each other as they are stacked onto pallets to create a solid stack. This helps them to remain stable on the pallet. Pallets come in different sizes. The most common pallet used has dimensions of 1 x 1.2 m and is referred to in South Africa as a white block pallet or internationally as a standard pallet or universal pallet. Most pallets used by South African exporters are made of wood. However, single use or reusable plastic pallets are an alternative to wooden pallets.

Wooden and plastic pallets

Stacking cartons onto pallets

The number of cartons stacked onto a pallet depends on the size of the cartons. Pallets have a maximum height depending on the mode of transport. High-cube pallets are used for shipping in reefer containers whereas standard height pallets are used for shipping in specialised reefer vessels. Pallets packed for export include various elements such as locating sheets placed every few layers to help with stability on some carton types, a top sheet when open top cartons are used, corner pieces and strapping.

Stacked cartons on a pallet

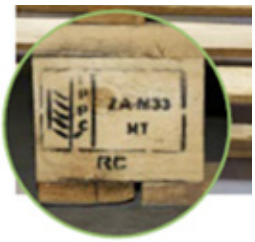
Pallet ID stickers

A pallet identification sticker and barcode include all the relevant information about the fruit on the pallet, such as the fruit type, place and country of origin, grower, exporter, market where it is going to and when the fruit was packed. The information on the pallet ID sticker matches the information on the cartons stacked on the pallet and the fruit in the carton. The pallet ID barcode is scanned each time the pallet is moved to track the location of the pallet. Four pallet ID stickers are placed on each pallet.

Pallet ID sticker

Pallet treatment and certification

Wooden pallets used for export must be heat treated or fumigated and carry ISPM 15 certification. ISPM 15 is a global standard developed by the International Plant Protection Convention (IPPC). It regulates the treatment of wood packaging to prevent the spread of pests and diseases in international trade.



ISPM 15 certification stamp

3.4 Packaging innovation

Packaging is one of the biggest costs in the export value chain. While it plays a crucial role in preserving product quality, it can also have a considerable environmental impact. At the same time, packaging offers a valuable opportunity to differentiate fruit in the marketplace.

For exporters and other stakeholders in the value chain, packaging innovation provides an opportunity to address key challenges such as:

- Reducing packaging costs
- Minimising environmental impact
- Enhancing consumer convenience
- Improving visual appeal
- Maintaining product quality
- Increasing shipping efficiency

One of the biggest drivers in packaging innovation in recent years is the environmental impact of packaging. Under the European Green Deal, the EU's new Packaging and Packaging Waste Regulation (effective 2025) introduces strict rules for plastic packaging in retail to reduce waste and enhance sustainability. Key measures include bans on certain single-use plastic items by 2030, mandatory recyclability and minimum recycled content targets (up to 65% by 2040) and limits on empty space in packaging. Clear labelling requirements and design-for-recycling criteria will also be enforced to support consumer sorting and circularity.

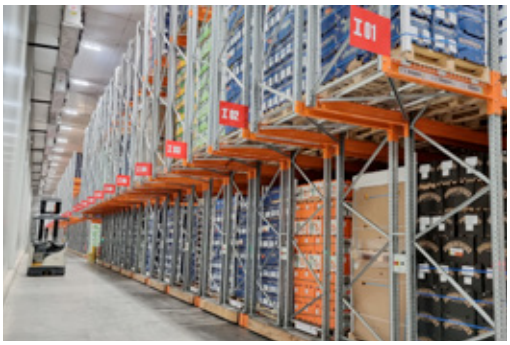
CHAPTER SIX

Cold storage and the cold chain

1. What is the cold chain?

The fresh produce export cold chain can be defined as the seamless movement of fresh produce through the trade chain, from the initial intake cold store, through various storage and transport mediums, to the marketplace, with minimal change in the optimum storage temperature and relative humidity.

Given that temperature is one of the greatest determinants of fresh produce deterioration rates, effective cold chain management goes a long way to maintain the fruit condition and extend the shelf life of fresh produce.


Fruit cartons in a cold store

The Perishable Products Export Control Board (PPECB) is the legislated custodian of the fresh produce cold chain for exports from South Africa. It develops post-harvest handling protocols that set out the procedures to be followed throughout the export cold chain. These protocols include, among other things, specific requirements for temperature, relative humidity and ventilation for each fruit type which are set out in the PPECBs - Ordinary Handling Protocol HP22. The PPECB verifies that export fruit is handled in accordance with these protocols. Any break in the cold chain can negatively affect fruit condition and may even result in rejection of the fruit. In addition to developing and monitoring handling protocols, the PPECB also inspects and certifies cold chain infrastructure and equipment - such as cold stores, refrigerated vehicles, reefer containers and specialised reefer vessels.

2. What is the purpose of keeping fruit cool?

Fruit is a living and breathing (respiring) organism and climacteric fruit continues to ripen after picking. As the fruit respires, it absorbs oxygen and releases heat, carbon dioxide and ethylene (a hormone that helps to ripen climacteric fruit). For every 10° that the temperature increases, the respiration rate doubles. In other words, the warmer it gets, the faster fruit respires, and the faster climacteric fruit ripens. It is therefore necessary to remove the heat and the ethylene to slow down the ripening process and senescence (the biological process of deterioration with age). The most important reason for doing this is to extend the shelf life of the fruit. For example, an apple that is picked and stored at room temperature of around 22°C, will last about 20 days before it starts to decay. If it is kept at a temperature of 0,5°C, however, a satisfactory condition can be maintained for as long as nine months.

3. What is the shelf life of fruit?

The shelf life of a fruit refers to the period from when the fruit is picked to the point that the quality has deteriorated such that it no longer meets consumer expectations. Fruit types like blueberries, avocados, stone fruit and table grapes have a relatively short shelf life of several weeks, requiring careful management to ship by sea. Some older blueberry varieties and highly perishable stone fruit varieties do not have a long enough shelf life to ship by sea and can only be shipped by airfreight. Other products like hard citrus (oranges, lemons and grapefruit) and apples have a long shelf life and can last several months under refrigeration.

4. At what temperature should fruit be stored?

Optimum storage and carrying temperatures vary from one fruit type to another and even in some instances from one cultivar to another and/or depending on fruit maturity.

Fruit carrying temperatures are legislated and administered by the PPECB who publish the carrying temperatures in the Ordinary Handling Protocol HP22. The chart below sets out the typical carrying temperatures for export fruit and provides an indication of whether controlled atmosphere (CA) storage or shipping in CA containers is commonly used.

TABLE INDICATING TYPICAL TEMPERATURE RANGES FOR EXPORT FRUIT

Fruit Commodity	Typical Carrying Temperature	Controlled Atmosphere (CA) Storage or Shipping
Oranges	2 °C - 4.5 °C	No
Soft citrus	1 °C - 4 °C	No
Lemons	4 °C	No
Grapefruit	1 °C - 4 °C	No
Apples & pears	Heat sensitive varieties: -1.2 to -0.5 °C Non-chill sensitive varieties: -1 to 0°C Chill sensitive varieties: >0°C	Yes. Apples can be stored for up to 12 months in CA storage.
Table grapes	-0.5 °C	No
Plums	0 - 1 °C 1 - 2 °C (loading temp. for dual temp. shipments)	No
Nectarines & peaches	0 - 1 °C	No
Avocados	3.5 - 6 °C (depending on maturity)	Yes. Avocados are normally shipped in CA containers.
Mangoes	10 - 13 °C (depending on maturity and cultivar)	No
Litchis	1 °C	No
Blueberries	0 °C	Yes. Blueberries are normally shipped in CA containers.

Note: The above table only serves to indicate the typical carrying temperatures or temperature ranges for export fruit. However, specialist technical guidance should be sought to determine the optimal shipping temperature for each circumstance considering factors such as maturity, cultivar and market and all carrying temperatures must be within the prescribed regulations as published in the PPECBs - Ordinary Handling Protocol HP22.

5. Chilling injury and freezing

Some fruit like bananas, mangoes, lemons and pineapples are sensitive to low temperatures and will be damaged if they get too cold (referred to as chilling injury). Chilling injury is the physiological damage that is induced in tissues when they are exposed to low but non-freezing temperatures. Symptoms of chilling injury include surface pitting, discoloration, internal breakdown, failure to ripen, growth inhibition, wilting, loss of flavour and decay. Chilling injury is a factor of temperature and time, for example, lemons may get chilling injury if stored at below 3°C for a period of 7-14 days or at 4.5°C for over 28 days. The application of cold treatment protocols for special markets can be problematic for fruit types sensitive to chilling injury.

A lemon showing chilling injury

Freezing of fruit is different to chilling injury and takes place when the water in the fruit freezes. Freezing will typically destroy fruit as ice crystals form in the cells and between the cells causing expansion (ice volume is 9% greater than water volume). This causes the cell walls within the fruit rupture and the fruit loses its structure. Freezing will typically take place at between -1 to -2.5°C depending on the sugar content. Freezing can take place in forced air-cooling tunnels when operators are under pressure to get the fruit to temperature quickly and drop the delivery air temperature too low, particularly in the cartons stacked against the cooling fans.

6. Humidity and ventilation in cold stores

During storage, fruit loses moisture resulting in weight loss and a deterioration of eating quality. Cold stores are therefore designed to operate at a high humidity of 90-95% to reduce moisture loss. Regular atmosphere cold stores are also designed to ensure adequate ventilation to avoid a build-up of carbon dioxide and an increase in ethylene levels which will speed up the ripening of climacteric fruit. Ethylene scrubbers can also be fitted to cold stores for fruit very sensitive to ethylene.

7. Temperature monitoring devices

PPECB temperature protocols are measured using fruit pulp temperature. Fruit pulp temperature is measured by inserting probes into the fruit connected to wires, referred to as **thermocouples**. These wires are connected to a mobile temperature measuring device to measure the fruit pulp temperature. Pallets with thermocouples attached are labelled with a yellow sticker for easy identification as required by the PPECB.

Mobile temperature measuring device

During transit, one or two temperature data loggers are inserted in each shipping container placed in fruit cartons in specific locations in the shipping container. The temperature data can either be downloaded when the container reaches its destination, or some models are equipped with mobile SIM cards and the temperature can be remotely accessed throughout the journey. This data serves to monitor, manage and police the cold chain during transit and serves as evidence in the case of claims.

Temperature logger

The image below reflects the data downloaded from a temperature logger for a shipment from Cape Town to China over a period of 30 days. In this example, the average carrying temperature was just over 0.5 °C (blue line) and the average humidity was 90% (purple line).

GRAPH SHOWING DATA FROM A TEMPERATURE RECORDER

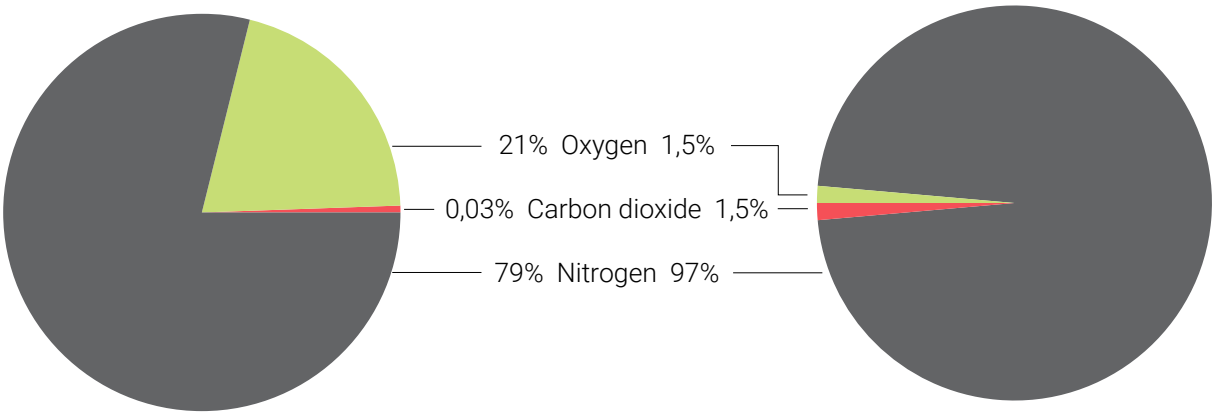
8. Regular atmosphere (RA) and controlled atmosphere (CA) storage

A regular atmosphere (RA) cold store refers to a cold store in which the air composition is not controlled. This is generally how fruit is cooled.

In controlled atmosphere (CA) storage the air composition of the cold store is controlled. The purpose is to extend the shelf life of the fruit being stored. In CA storage fruit is placed in an airtight cold store, the oxygen levels are lowered, and the carbon dioxide and nitrogen levels are raised (refer to figure below). This causes the fruit to respire more slowly. The slower the fruit respires the longer it takes to ripen and the longer its shelf life will be. Some fruit types greatly benefit from CA storage, while others receive little benefit (refer to chart on pg 71). Apples greatly benefit from CA storage enabling some cultivars to be stored for up to 12 months, allowing year-round supply of apples to the local market. The oxygen concentration in CA stores is too low to support life and quality control inspectors who enter a CA store to take samples must wear respirators.

Some refrigerated shipping containers are also equipped for CA storage and are used to ship sensitive products such as blueberries and avocados.

DIFFERENCES IN GAS CONCENTRATIONS IN RA AND CA STORAGE



Regular Atmosphere (RA)
Temperature = -0,5°C
Apple storage life: 3 to 5 months

Controlled Atmosphere (CA)
Temperature = -0,5°C
Apple storage life: 5 to 12 months

9. Cold treatment

Some markets have strict phytosanitary requirements. These requirements aim to ensure that no quarantine pests or diseases are carried by the fruit into the country receiving the fruit. Cold treatment is one of the common methods used to mitigate against the risk of transferring quarantine pests from one country to another. Cold treatment is also referred to in the industry colloquially as cold sterlisation or steri. Cold treatment protocols require produce to be cooled to a specified temperature and kept at this temperature for a specified period resulting in the death of quarantine insects.

Most cold sterilisation protocols require the fruit to be pre-cooled to a certain temperature (normally close to zero degrees Celsius), which needs to be maintained for a certain period (usually 72 hours) prior to loading the fruit into a container. Protocols then stipulate a further period during which fruit needs to be maintained below a certain minimum temperature during shipping (usually between 14 to 24 days). This is referred to as in-transit cold treatment.

PPECB monitor and sign-off the cold treatment process requiring temperature probes to be installed in the cold stores used for pre-cooling, which need to be certified for cold treatment by the PPECB. Three temperature probes are also inserted into each shipping container used for cold treatment by the PPECB. The temperature is measured inside the fruit, referred to as the pulp temperature.

Some cold stores are equipped with smaller chambers typically holding between 40 - 80 pallets used specifically for cold treatment as a cold store door cannot be opened during the 72 cold treatment pre-cool period.

Cold treatment chambers

10. Types of cold stores

Pre-cooling/Re-cooling

After fruit has been packed, its temperature must be lowered to the desired temperature prior to storage and/or loading into a shipping container. This process is called pre-cooling or re-cooling. The purpose of pre-cooling is to rapidly drop the temperature of the fruit to the desired temperature. The most common form of pre-cooling used in the fruit industry is called forced air pre-cooling. During forced air pre-cooling, a high volume of cold air is forced through the fruit until the fruit reaches the desired temperature. Some sensitive fruit types are also pre-cooled prior to packing to remove the field heat.

Two methods of forced air pre-cooling are commonly used in South Africa to pre-cool fruit:

- **Room cooling:** Where a portable fan is used with a tarpaulin to push the cold air through rows of pallets in a dispatch cold store.
- **Forced air cooling tunnels:** Forced air cooling tunnels with powerful refrigeration units and large fans which allows a high volume of cold air to move through the fruit.

Forced air cooling tunnel

Certain fruits, such as blueberries, stone fruit and table grapes, are sensitive and need to be packed and cooled as soon as possible. Considering this, and the fact that there is limited scope for mechanical packing of table grapes, they are typically packed on the farm and then transported to a nearby commercial cold store to be cooled as soon as possible. Other fruit such as citrus is less sensitive and can be transported at ambient temperatures to off-farm pack houses. After packing, in some instances citrus is transported

at ambient temperatures to cold stores where they are pre-cooled before loading into shipping containers. The PPECB allows some hard citrus varieties for specific markets such as the middle east to be loaded into containers at ambient temperatures, but this practice is becoming less common.

Holding rooms

Pome fruit, stone fruit and berry packhouses typically have their own intake and dispatch RA cold rooms as detailed below. In addition to RA holding rooms, many pome fruit packhouses have CA holding rooms for longer term storage of unpacked product.

Intake cold store

Intake cold stores are used to store fruit in bins or crates prior to packing. In intake cold stores fruit is stacked in bins up to 9 bins high for efficient use of space.

Dispatch cold stores are used to store packed fruit following pre-cooling and have racking systems to stack pallets up to 4 high in some stores for efficient use of space. Racking systems can either be static, with space for forklifts to drive in between rows, or mobile racking which moves on tracks to optimise space utilisation in the cold store. Fruit from dispatch cold stores is either loaded directly into reefer containers for export or transferred to a chilled cross-dock facility (refer to next section) from where it is loaded out for export.

Dispatch cold store with static racking

Chilled cross-dock facilities

Chilled cross-dock facilities, often situated closer to ports or at strategic locations in growing regions for the consolidation of fruit, handle packed fruit transferred from elsewhere, which can either already be cooled or arrive at ambient temperatures. Fruit is typically stored for a short period after which it is loaded into a reefer container for export or dispatched for loading on a specialised reefer vessels or aircraft.

Other services commonly offered by chilled cross-dock facilities include pre-cooling, cold treatment, breakdown and rebuilding of pallets of fruit (e.g. if damaged), container weighing by means of a weigh bridge and container plug in facilities. PPECB inspectors are stationed at each facility to supervise the loading of reefer containers and Department of Agriculture officials also carry out product inspections at cold stores for special markets.

Chilled cross-dock facilities are also referred to as commercial cold stores.

Refrigerated transport

Various forms of refrigerated transport are used to maintain the cold chain during transit. These include refrigerated trucks, reefer containers and specialised reefer vessels, which will all be covered in more detail in chapter 8 and 9.

Refrigerated truck

11. Managing the cold storage processes

Export agents and cold store operators both play an important role in the effective management of the cold chain.

The role of export agents in managing cold storage

- Pre-season booking - Space in cold stores is often limited during peak season and it is therefore vital for exporters to make use of pre-season volume estimates to book sufficient cold storage space. During this time exporters also negotiate storage rates with cold stores and sign storage contracts which set out the contractual responsibilities of the cold store and exporter.
- Stock management - It is the responsibility of the exporter to manage the stock at the various cold stores they use. Exporters have live access to their stock in cold stores via electronic stock management systems. Key elements of the stock management process include:
  - Stock intakes - Ensuring that the correct data such as variety, count, class and brand reflects for each pallet upon intake.
  - Stock age management – Unless product is being strategically stored for a later market window, it is vital to load out fruit as soon as possible to get it to the market promptly and avoid the risk of quality issues developing. Exporters therefore monitor the stock daily and load out stock as soon as they have sufficient fruit for a specific market or customer to fill a container and the fruit is cooled to the required temperature and a suitable vessel is available. A vital aspect of stock age management is using the First in First Out (FIFO) principle when loading out fruit or in other words, loading out the oldest fruit first.

Managing cold storage

The following management practices and design considerations are vital in ensuring that the cold chain is maintained in a cold store.

Cold store temperature monitoring dashboard

Maintenance and monitoring – The enforcement of good maintenance schedules and the continuous monitoring of temperatures is vital to ensure that there are no breakdowns or malfunctions which result in cold rooms not operating according to the set temperature.

Temperate management during product transfer –Transferring product from one cold environment to another provides a risk of breaking the cold chain causing the product to warm up. There are various management practices and design considerations that mitigate against this risk including the following:

- Loading docks/airlocks – loading docks enable refrigerated trucks and reefer containers to load directly from the cold store into the truck or container.
- Automatic doors, air curtains or plastic curtains – leaving cold store doors open during frequent transfer of pallets in and out of cold rooms results in the cold store temperature increasing. Key design elements which mitigate against this risk include either automatic doors, air curtains or plastic curtains.
- Ambient loading bays – Not all cold stores have loading docks and reefer trucks and containers must therefore be loaded in ambient loading bays. In these instances, it is vital that trucks and containers are loaded quickly to avoid product warming up. Good systems are required to facilitate this including the scheduling of loading times whereby each truck is provided with a slot time. Pallets must also be consolidating in a chilled dispatch area ready for loading prior to the allocated slot time.

Loading docks

- Stock management – Cold stores make use of stock management systems which use handheld barcode scanners to scan pallets in and out of each room when moved to track the location of each pallet. Radio frequency identification (RFID) tags provide an alternative to handheld barcode scanners for automated tracking of the location of pallets within the cold store.

Note that some of the documentation process and load out procedures associated with cold stores will be covered in the logistics chapter.

CHAPTER SEVEN

Information systems, data and statistics, research and development

1. Information systems

Information systems play a vital role in managing the complex processes across the fresh produce export value chain. With rapid advances in artificial intelligence (AI), the development and automation of these systems are accelerating significantly.

On **farms**, information systems are increasingly used to plan production, track input applications per orchard, monitor yield and quality data, and manage compliance with Good Agricultural Practices (GAP), as well as social and environmental standards. They also increasingly play a key role in scheduling irrigation. When used alongside technologies such as drones, satellite imagery, and GPS, these systems enable growers to apply the principles of precision agriculture, leading to more efficient and sustainable production. Keeping up with these technological developments is becoming crucial for growers to remain competitive in the global market.

In **packhouses**, information systems support the tracking of production volumes and pack-outs, managing quality assurance, compliance, inventory, production efficiency and pack line operation and automation. Many modern pack lines are highly automated, incorporating technologies such as optical grading systems and robotics.

Exporters rely on information systems for real-time stock tracking, cost management, grower payments, quality control, claims handling, logistics coordination, and export documentation. Systems like Supply Chain Management (SCM) and Enterprise Resource Planning (ERP) are essential for ensuring smooth coordination among growers, packhouses, cold storage facilities, logistics providers, forwarding agents, and international customers. There are several software service providers, some of whom are FPEF members, who provide systems used in the industry, though some larger exporters operate proprietary systems.

Additional vital information systems in the export value chain include:

PPECB's Titan2.0 system – Used for electronically capturing inspection data, issuing export certificates and export notifications.

DoA's PhytClean system – Manages the electronic registration and certification of growers for special export markets.

DoA's eCert platform – Issues electronic phytosanitary certificates required for exports. From October 2025 the PPECB took over management of the eCert platform.

NAVIS system used by Transnet – Manages the flow and positioning of containers within South African ports.

SARS's Electronic Data Interchange (EDI) platform – Enables the electronic submission and processing of customs-related documents such as Customs Declarations. Several of these systems integrate via application programming interface's (API's) with exporters' platforms, allowing for seamless data exchange across the entire value chain.

2. Data and Statistics

Increasingly, data analytics tools help stakeholders anticipate trends and provide insights that drive objective decision-making and operational optimisation. Data analytics is an invaluable tool that enhances our ability to compete in global markets and deliver consistent value to both growers and international buyers. By harnessing real-time and historical data - such as local and Southern Hemisphere production forecasts, shipped volumes, packouts, quality assessments, export market prices and shipping schedules we gain a comprehensive view of the market and supply chain. This data allows us to forecast market demand more accurately, match fruit specifications to the right markets, and optimise logistical decisions such as shipping routes and timing. Additionally, we can monitor trends in rejection rates, identify recurring quality issues, and implement corrective actions swiftly. The result is improved decision-making, better alignment between supply and demand, reduced waste, enhanced profitability, and stronger, data-driven relationships with both growers and buyers.

Data analytics, machine learning and AI present great potential to enhance the accuracy of crop forecasts, which are essential for pre-season and in-season planning across logistics, operations, resource and market allocation.

Data and Statistics Sources

Helpful data and statics sources include the following:

- **Information systems** - Information systems used by value chain players such as growers, packhouses and exporters generate vast quantities of proprietary data which provide a valuable source of data if effectively extracted via data analytics tools.

- **Fruit Commodity Organisations** - The commodity organisations under Fruit South Africa (CGA, Hortgro, SATI, Subtrop, BerriesZA and FPEF), all compile annual reports including very useful data and statistics for each commodity including plantings by variety and age, production volumes, packouts and exports per market. Some commodity organisations also include price and production cost data. The reports are available for download via their respective websites.

- **Agrihub** - Agrihub is a private company established by the fruit commodity organisations which extracts granular export data from all exporter systems creating a comprehensive, up to date export data base with helpful reports and dashboards. Industry players can subscribe to Agrihubs services to access export data.

- **PPECB** - The PPECB have an export data base generated by Titan2.0 from inspection data. The PPECB publishes summarised export data in an annual report available from their website.

- **Private benchmarking studies** – There are a handful of private companies who conduct surveys to collect proprietary income, cost, production and sales data for multiple commodities, areas, growers and exporters to enable value chain players such as growers and exporters to benchmark their performance with that of competitors.

- **BFAP** – BFAP is a non-profit company whose purpose is to inform better decision making in the agricultural sector by providing unique insights gained through rigorous analyses, supported by credible databases, a combination of integrated models and experience. They publish an annual baseline report which presents a 10-year outlook of agricultural production, consumption, prices and trade in South Africa which includes the major fruit export commodities.

- **South Hemisphere Fruit Alliance (SFA) -** The SFA (formerly SHAFFE), is composed of leading trade associations in the Southern Hemisphere produce sector from Argentina, Australia, Brazil, Chile, New Zealand, Peru, South Africa, Uruguay and Zimbabwe. Their mission is to connect the Southern Hemisphere fresh fruit industry through knowledge sharing, facilitating market access and promoting global fruit trade. SHAFFE provide consolidated, Southern Hemisphere production and export statistics for various fruit commodities.

- **ITC Trade Map & FAO Data Base** – The ITC Trade Map and FAO Data Base provides high level global trade statistics.

3. Research and development in the fresh fruit industry

Research and development (R&D) is a cornerstone of competitiveness and sustainability in South Africa's export-oriented fresh fruit industry. R&D is critical to maintaining global market access, meeting phytosanitary requirements, driving efficiency and adapting to shifting consumer preferences and climate realities. R&D underpins every stage of the value chain, from cultivar development and production practices to postharvest handling, logistics, and market intelligence.

At the pre-production stage, research focuses on **plant breeding and cultivar development**. Exclusive and semi-exclusive proprietary varieties play an increasingly important role in the fruit export industry. While most of the new varieties released are from privately owned breeding programmes, public institutions like the Agricultural Research Council (ARC) are also involved in plant breeding. Intellectual property rights are often managed through private entities which commercialise new varieties. Growers pay royalties to plant and/or market privately owned varieties, which can be a considerable cost in the farming of fruit.

A research and development scientist at work

During on-farm production, R&D concentrates on **improving agricultural practices** such as - irrigation efficiency, integrated pest management (IPM), nutrient optimisation, and sustainability. R&D is vital in primary agriculture in generating applied knowledge for growers to improve yields, quality, and compliance to remain competitive.

Postharvest and packhouse research aims to optimise storage, efficiency, packaging, cold chain integrity, and shelf life while reducing losses and ensuring fruit meets strict international phytosanitary and quality standards. Research in this space ensures that fruit remains marketable after long shipping times to markets across the globe.

R&D in the fresh produce **logistics sector** focuses on improving efficiency, reliability and quality preservation of fruit throughout the supply chain. This includes innovations in cold chain technology, packaging materials and tracking systems. Research also explores optimising port handling, shipping routes, and turnaround times.

At the **market and trade** level, R&D includes gathering market intelligence, consumer preference studies, and policy analysis. This is crucial for identifying new opportunities, responding to trade policy shifts, and ensuring compliance with evolving non-tariff barriers such as maximum residue limits (MRLs) and traceability requirements. Institutions like the Bureau for Food and Agricultural Policy (BFAP) support this strategic research, providing data-driven insights to guide policy and industry strategy.

Key players across the R&D spectrum include:

- Industry bodies such as Hortgro science, the Citrus Research Institute, SATI and the FPEF's Post Harvest Innovation programme.
- Academic institutions (primarily universities).
- Non-profit research entities such as BFAP.
- Privately owned R&D companies and value chain players.
- Government entities such as the ARC, DoA and PPECB.

R&D covers multiple disciplines including; genetics, entomology, plant pathology, horticulture, food science, engineering, computer science, logistics, supply chain management, marketing etc.

CHAPTER EIGHT

Road and rail transport

This chapter covers road and rail transport of fruit for export by sea, air or road. This includes unpacked fruit in bins and crates, pallets of fruit packed in cartons or reusable plastic containers (RPC's) and processing grade fruit in bulk bins typically stacked two tiers high on pallets. Once fruit has been cooled to its prescribed shipping temperature - according to the PPECB Handling Protocol HP22 - it must be transported under a strict, unbroken cold chain.

1. Inland transport options

• Direct container shipping

Packed fruit may be loaded directly at inland cold stores into 12-meter refrigerated sea containers (globally referred to as reefer containers) for transportation to a port by road or rail. A key advantage of loading at source directly into reefer containers is that it eliminates double handling of pallets and enables the cold chain to be maintained from the point of loading through to final delivery.

Note that a container can be loaded at two different cold stores/load points but no more according to PPECB protocols.

• Chilled cross-dock transfer

Alternatively, fruit may be transported from an inland cold store or packhouse to a chilled cross-dock facility by truck, where it is loaded into a reefer container or Unit Load Device (ULD) for airfreight or transferred to a reefer vessel. These facilities are primarily designed for consolidation and cold treatment of fruit for export. Export fruit is not stored here longer than necessary to prepare consolidated shipments and await available shipping options. Cross-dock facilities are either located at strategic locations inland for the consolidation of fruit or near ports.

Once loaded and sealed, containers can be moved to export terminals by rail or road, with continuous generator-powered refrigeration for any transport exceeding the Time-Temperature Tolerance (TTT) defined in the PPECB's HP22 for each fruit type.

• Ambient transfers for hard citrus

For some markets such as the Middle East or Russia, hard citrus (oranges, lemons and grapefruit) may be transported at ambient temperature to a chilled cross-dock hub with a maximum journey time of 16 hours according to PPECB protocols and for some markets hard citrus can also be loaded into shipping containers at ambient temperatures whereafter cooling commences.

• Short-distance transfers

Table grapes are packed on farm due to their perishable nature and most table grape farms lack the scale for on-site cooling facilities. Packed pallets are therefore typically shuttled from the packhouse to a nearby chilled cross-dock or cold store using unrefrigerated, flatbed 5–10 ton trucks. These trips are:

- Initiated once 4–10 pallets are ready.
- Made over short distances (5–35 km).
- Subject to a maximum TTT of 2 hours, as per PPECB protocol.

2. Types of road freight vehicles

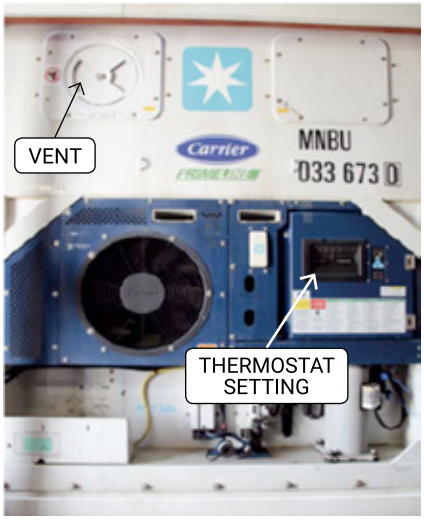
• Reefer container on skeletal trailer/container chassis pulled by a truck (also known as a horse)

The most common mode of freight for fruit exported from South Africa are 12-meter (40 foot) **reefer containers** designated as 45R1 equipment in documentation (also known as **reefers**). This code denotes a container that can both provide cooling to minus thirty-five degrees (-35.0ºC) and heat to plus thirty-five degrees (+35.0ºC). Heating is necessary in reefers when shipping fresh produce to cold climates where temperatures often drop well below 0ºC. Reefers are insulated and equipped with refrigeration units and ventilation. However, the refrigeration unit does not have its own power source and needs to be plugged into a power source to operate. When transported on skeletal trailers, a diesel generator is used which is attached to the bottom of the trailer referred to as a **genset**. Gensets are always used for sensitive products such as blueberries. For products like apples, citrus and table grapes, the PPECB does not require a genset for journeys shorter than 2 hours, however, many exporters still prefer to use a genset in case there are delays on route to the port or during off-loading in the port. It is the responsibility of the exporter/logistics agent to specify whether a genset is required when booking the transfer. When on land or on a vessel, reefer containers are plugged into an electrical plug point referred to as a **plug-in**. The refrigeration unit is typically powered continuously - from stuffing through transport to final delivery - to maintain cold chain integrity. Reefer containers can also be equipped for controlled atmosphere (CA) transfer. Reefer containers typically carry 20 standard white block pallets but can carry up to 23 pallets with other pallet types.

Reefer container on container chassis pulled by a truck

There are thirty-three container manufacturers, thirty-two of which are in China. Only five manufacture reefer containers. Except for Maersk Container Industry (MCI), all four other manufacturers make containers that enable the customer to choose the refrigeration machinery. Only Carrier Transicold, Daikin Reefer, Star Cool (MCI) and Thermoking supply refrigeration machinery for reefers. Carrier Transicold and Daikin Reefer dominate equipment on the South African trades, because their after-sales back up provided.

Technology in container cooling machinery is continually advancing, whether it is towards more environment friendly machinery or advancement in software development for remote reporting of time, location, temperature and humidity. Automatic ventilation devices (AV+) intelligently monitor the concentration of O^2 and CO^2 gases inside the container. If concentrations rise beyond the levels that were set for the specific cargo, a valve automatically opens to let in fresh air in to maintain the optimum atmosphere. The technology benefits the export industry in three ways. It saves power, controls temperature more accurately, and controls the entry of ambient air. Some sensitive horticultural cargo previously sent by air freight can now be exported in containers fitted with AV+ devices or using CA reefer containers.



Reefer container temperature and vent settings

Containers are owned either by the shipping line (carrier) or by a container leasing company. Carriers typically own 50% to 60% of their fleet of reefer containers while the rest are leased from one or more leasing companies. This enables the carrier to swell or shrink inventory to meet market demands as well as to flush out aging equipment. Maersk is the only carrier that chooses to own its entire reefer container fleet.

• Refrigerated Trailers/Reefer Trailers

Reefer trailers have a permanent, insulated refrigeration box, with a refrigeration unit powered by a built-in diesel generator. They can be used for transporting unpacked, sensitive fruit such as blueberries from farms to the packhouse, or to transport packed and chilled fruit from an inland cold store to a chilled cross dock. They come in different sizes from the smallest rigid vehicles with a 1 tonne load capacity, to the biggest articulated triaxle trailers with a load capacity of around 26 pallets, weight dependant. A key advantage of using triaxle reefer trailers to transport packed fruit from an inland cold store to a chilled cross dock near the port is the cost saving in the case of longer journeys, given that they can carry around 26 pallets, rather than the typical 20 pallet capacity of a reefer container. The disadvantage of this option rather than loading reefer containers at source is the double handling of pallets and the risk of breaking the cold chain during loading and off-loading.

Truck with triaxle reefer trailer

• Tautliner

A tautliner is a non-refrigerated trailer with vinyl curtain sides to keep the product dry and dust free. They come in various sizes from smaller rigid trucks to the largest interlink trailers with a carrying capacity of around 34 pallets. Interlink trailers consist of two parts, usually a shorter front trailer and longer rear trailer joined by a turntable.

Tautliners are used to transport relatively less sensitive fruit types like hard citrus and apples in bins from farms to packhouses or in some instances to transport packed hard citrus from a packhouse to chilled cross dock. Packed apples for the local market are also often transported in tautliners. Tautliner interlinks provide the lowest cost option given their ability to carry up to 34 pallets and their lower operating cost compared to reefer trailers and reefer containers as they do not have refrigeration units. However, they cannot be used for long journeys or for sensitive products as they are not refrigerated.

Tautliner

3. Rail Transport

Reefer containers are fully intermodal and can be moved efficiently by rail, which is environmentally friendly and cost-effective over distances greater than about 450 km. Rail transport over shorter distances from inland container depots or chilled cross docks to the port, while not more cost effective than road freight, are in the national interest to reduce congestion in port cities. Such transfers are also beneficial for exporters to avoid delays caused by traffic congestion when delivering to the port as trains deliver containers directly into port container terminals. Currently all rail services are offered by the national rail carrier Transnet Freight Rail (TFR). However, TFR have released a network statement inviting private train operating companies to submit bids to operate rail services on Transnet infrastructure in future.

A full train set includes:
• Traction locomotives
• A caboose (with security and technician)
• A generator and fuel wagon
• 48 flatcars carrying 12-meter containers

TFR are currently running services to transfer citrus in reefer containers from City Deep in Johannesburg and Bela-Bela to the port of Durban.

Transnet train

4. Inland Container Depots (ICD's)

ICD's at **Belcon (Cape Town)** and **Hammarsdale (KZN)** serve as off-port container hubs, providing:

- Space and plug in points to accumulate full containers.
- Access to empty containers.
- Escape from urban congestion and port delays.

The above ICD's are linked by rail directly to port terminals. Night-time rail shuttles are common for improved turnaround. Optimising the use of ICD's allows exporters to avoid congestion, gain flexibility in timing, and improve overall efficiency - especially in a post-disruption shipping environment.

Further to the above, some chilled cross dock facilities are now also providing plug in points to provide power to stuffed containers awaiting the opening of stacks.

5. Reefer Container Loading Procedures

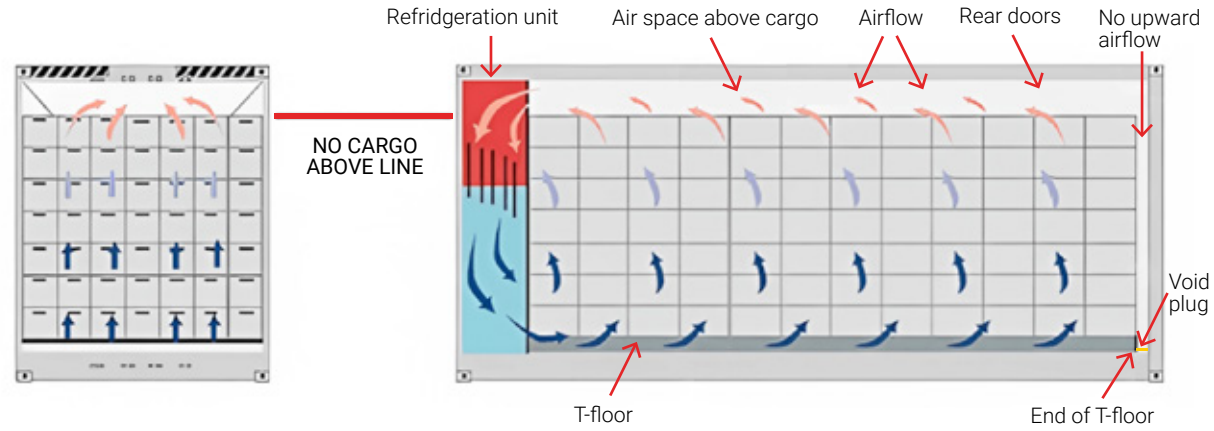
Before loading, cold store dispatch staff on behalf of the shipper and PPECB (who supervise the loading) should check the following:

- The inside of the trailer is clean and odour-free.
- The refrigeration system is functioning properly, and the temperature and vent settings are correct as per the carrying instructions.
- Door seals are intact and functional.

During Loading

- Ensure that fruit is pre-cooled to specified carrying temperature (PPECB will not allow fruit to be loaded beyond a tolerance of ±0.5°C to ±1.0°C of the target carrying temperature, depending on the fruit type and market requirements except for hard citrus to some markets).
- Ensure fruit is loaded correctly to enable airflow through pallets.

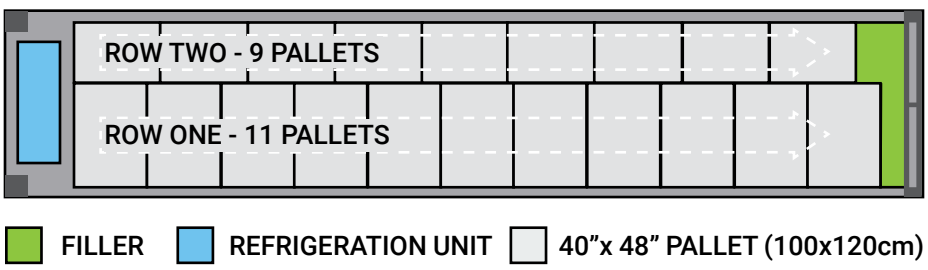
DIAGRAM ILLUSTRATING AIRFLOW IN CONTAINERS



Key loading practices to ensure good airflow include:

- Stack pallets according to correct load plan as per example below for white block pallets.

DIAGRAM ILLUSTRATING KEY LOADING PRACTICES



Source: PPECB

• Do not load above the top red line or in front of the red line by door.

Top red line

• Use void plugs
A void plug is a cardboard sheet placed on the floor to prevent airflow through the T-bars on the floor at the back of the container as indicated on the right.


Void plug

• Load fruit quickly to minimise temperature rise when loading at ambient temperatures.

• If delays occur:
  - Run the refrigeration unit.
  - Keep doors closed.

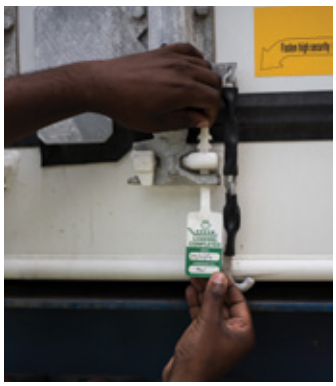
• Do not mix **warm and chilled fruit**, or **different temperature requirements** in the same load.


Dunnage bag

• Take care when loading heavy pallets that the maximum axle weight of 9 tonnes is not exceeded as per the requirement of the Road Traffic Act.

• Use **dunnage bags** where necessary to prevent pallets falling over in transit - especially with telescopic cartons which are less stable.

After loading:
• Ensure doors are sealed properly.
• Fit the numbered customs seal to the door as per the PPECB protocol.
• Re-confirm temperature settings are correct.


Fitting the numbered customs seal to the door

Both the **shippers** representative and **driver** are responsible for ensuring:
• Proper stacking.
• Correct temperature setting.
• Sealed doors.

CHAPTER NINE

Sea freight and air freight

South Africa trades both internationally and within Africa. The choice of logistics route-to-market is influenced by a range of factors including volume, cost, transit time, carrier capacity, equipment availability, infrastructure and port service levels. These have become the primary decision drivers in recent years due to various global disruptions.

Recent events such as the COVID-19 pandemic, the Suez Canal blockage, Red Sea attacks, Panama Canal water levels, broader geopolitical tensions and congested ports have reshaped the logistics landscape. In today's world, there is no longer a "normal". These dynamics continue to challenge the industry's ability to maintain timely vessel arrivals and departures.

Regardless of the mode of transport, four foundational principles apply:

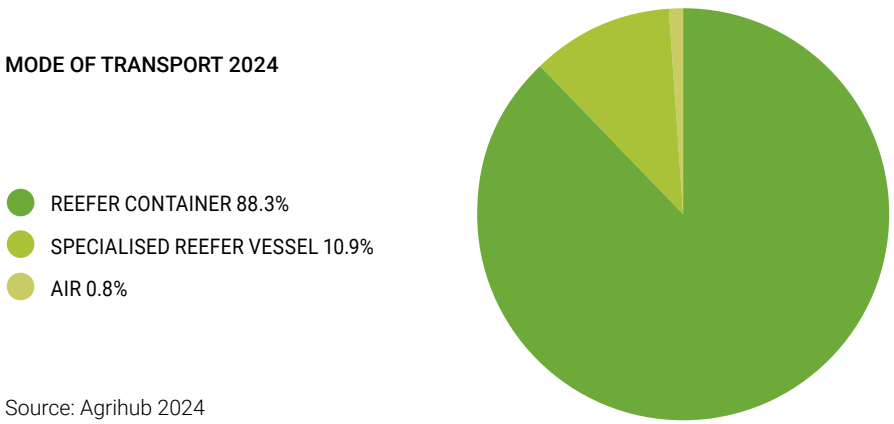
- **Forecasting Requirements:** Accurate forecasting is essential. Cold stores, trucks, containers, ships, and aircraft are only available through coordinated planning. Annual shipping forecasts, updated weekly with a four-week rolling forecast, enable carriers to allocate equipment and schedules effectively. These forecasts incorporate seasonal, weather, production, and market variables.
- **Transport Readiness:** Cargo and the means of conveyance must meet strict sea, road, and rail standards. The PPECB inspects all transport equipment prior to loading. Non-conforming vehicles or containers are not approved for fresh produce transport. Reliable planning and execution directly influence service levels. "Last-minute.com" shippers are unsustainable.
- **Attention to detail:** The logistics environment is complex, ever changing, unpredictable and has strict compliance requirements. Value chain players therefore need to have "their finger on the pulse" and respond proactively to ensure timely delivery of shipments.
- **Communication:** There are multiple players in the logistics process and excellent communication is required to coordinate activities, track execution and pivot when necessary.

1. Intra-Africa trade

In the case of intra-Africa trade, road transport remains the most flexible and responsive mode for cross-border shipments into Southern Africa. Sea freight is commonly used to supply countries in central and northern Africa such as Nigeria, Ghana and Kenya. Unfortunately, rail remains limited by incompatible gauges, political and service delivery constraints. Land transport is covered in the previous chapter; this section focuses on air and sea freight.

2. Modes of transport

The split of South African fruit exports by container vessel, specialised reefer vessel and air is illustrated in the chart below.



Source: Agrihub 2024

2.1 Airfreight

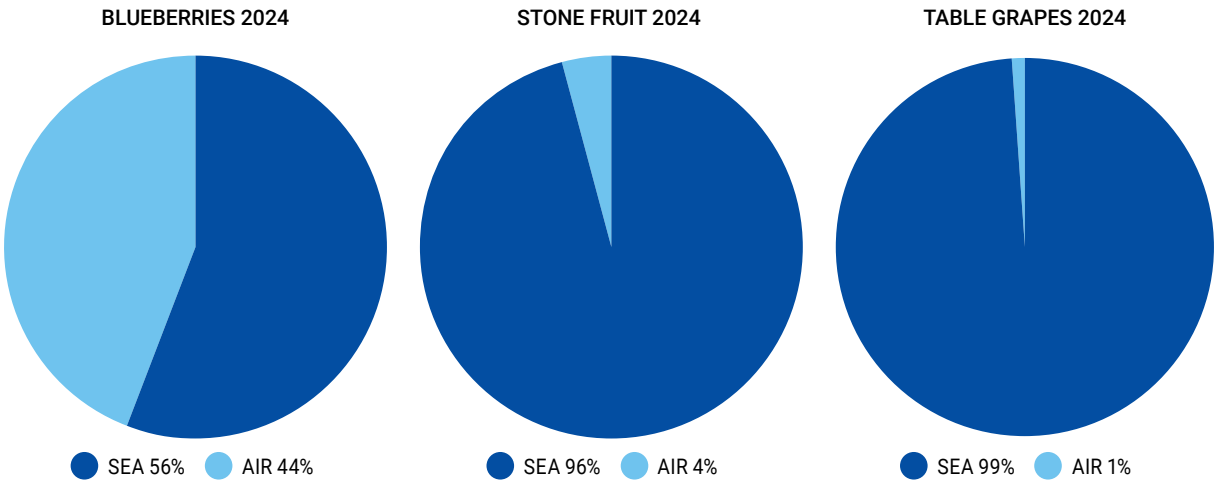
Airfreight plays a vital role in the fruit industry, particularly for perishable products with a short shelf live and at times to fill supply gaps when sea freight product will not arrive in time. However, air transport is constrained by high costs, a high environmental footprint and limited capacity.

The cost of airfreight is typically at least 5 times higher than sea freight and it is therefore only suitable for products with a high value to weight ratio. Further to this, the carbon footprint of airfreight is around 38 times higher than that of containerised sea freight (IMO GHG study, 2009).

Cartons of fruit being loaded for airfreight

Heavier airfreight commodities are charged by weight, whereas lighter products such as flowers or some fresh produce packed in punnets are charged by volume. Grapes and stone fruit are typically charged according to the actual mass, simplifying cost estimates. Where products are charged by volume, it is vital to optimise the packaging format to limit the amount of empty space in the carton or punnet.

The split between sea and airfreight for the three fruit commodities which make up the bulk of airfreight fruit from South Africa is illustrated below.



Source: AgriHub 2024

Most fruit is transported in the cargo holds of scheduled passenger flights. Limited flight frequency from South Africa and high charter costs restricts available space. Chartering is rare and used only when market demand justifies the expense.

When fruit is airfreighted, the title document issued by the airline proving ownership of the cargo is referred to as an **airwaybill.**

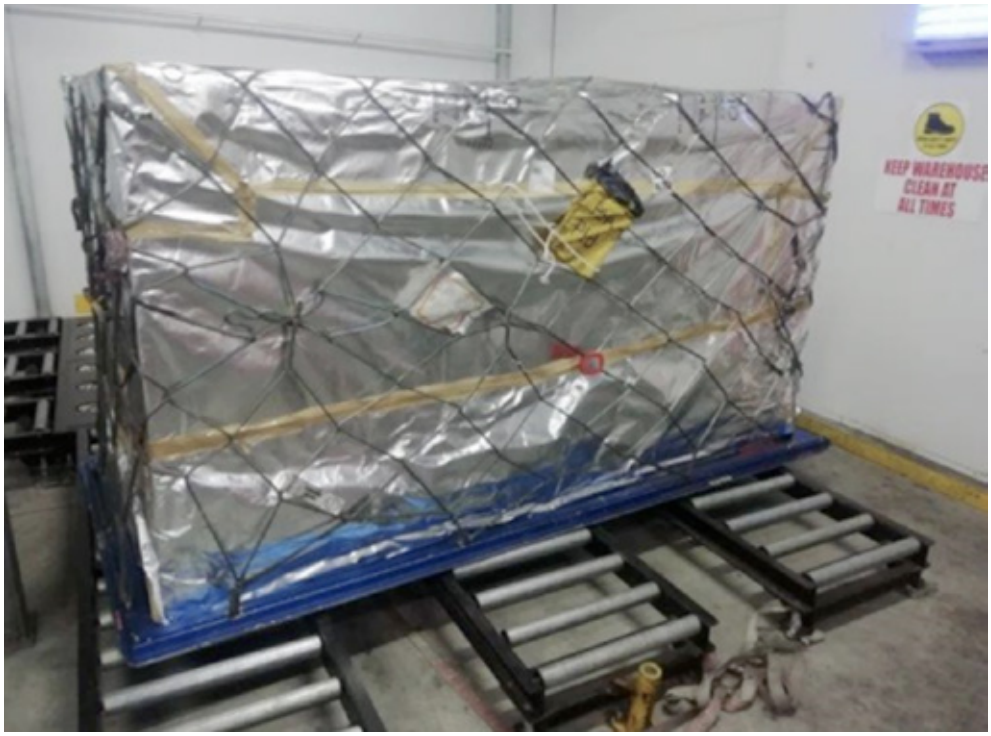
2.1.1 Airfreight cold chain

Cold chain management of fresh produce by airfreight is challenging as the cold chain is not maintained during the loading of aircraft and as aircraft cargo holds carry different types of cargo including live animals at times, in which case temperatures can be set as high as +22°C. However, the poor cold chain is mitigated by the speed of airfreight with transit times to key export destinations typically under 12 hours. By its very nature, fruit delivered by air has a dwell time of only a few days between picking and consumption. Any cold chain deficiencies or handling errors are therefore often undiscovered, because they have not had the time to manifest themselves upon the physiology of the fruit.

Temperature control in the hold of the aircraft is controlled in the cockpit, by the first officer. At an altitude of 11 000 meters, the ambient air temperature is around -52.0ºC and the aircraft hold is heated to maintain the desired temperature which typically ranges from +2.0 up to +22°C. Air is sucked into the aircraft from outside and is heated by heat exchangers that pump the air over the fuel tanks to prevent fuel becoming gel, before being scavenged to heat the cabin and hold. Many aircraft types have their cargo holds divided into two compartments, allowing two different temperature regimes while others only have a single hold.

Fresh produce exporters can use the following management practices to mitigate the impact of poor cold chain during shipment:

- Make use of specialist fresh produce logistics agents with landside cold stores at the airport and focus on limiting dwell times when loading aircraft.
- Wrap airline pallets in space blankets to reduce heat loss and reflect external radiation.
- Insert dry ice in a few cartons within the stacked airline pallet.



Fresh produce packed on an airline pallet with space blanket ready for dispatch to the aircraft

2.1.2 Equipment:

An aircraft Unit Load Device (ULD) is an aluminium container or pallet used to securely load and transport cargo in an aircraft's cargo hold, optimising space and handling efficiency. Common ULD's include PMC and PAG aircraft pallets, with a carrying capacity of about 3 tonnes and the smaller containers such as AKE's or AMJ's which are less suitable for fresh produce due to their diagonal corners. The type of ULD used is dependent on the type of aircraft used. Airline handling agents refer to the wooden pallets that fruit is delivered on as skids. When fruit is shipped by airfreight, the cartons are removed from the skid/wooden pallet and packed loose onto the airline pallet to reduce freight cost.

Example of Unit Load Device (ULD) - AKE

2.1.3 Airfreight challenges

The following logistics challenges can be encountered when shipping by airfreight:

- Failure to use allocated space ("no-show") incurs penalties.
- Booked flights are not guaranteed due to:
  - Excess passenger weight and luggage displacing cargo.
  - Elevated ground temperatures reduce lift, which reduces cargo capacity.
- Cargo may be "bumped" (offloaded) to accommodate weight or fuel adjustments.

2.2 Sea freight

Sea freight remains the primary mode of transport for fresh fruit exports from South Africa.

There are two main options for sea transport:

- **Cellular vessels/container vessels** – Carry 12-metre integral reefer containers.
- **Specialised Reefer Vessels (SRVs)** – Carry loose palletised cargo in refrigerated holds. These vessels were also traditionally known in the industry as conventional vessels, and this outdated term is still used in the industry.

A third less common option with limited capacity for reefers are **multi-purpose vessels (MPVs)**, also known as general cargo vessels. MPVs carry general cargo in holds but also carry containers above deck with some MPVs also equipped with plug-in points for reefer containers.

Typical **transit times** for sea freight varies from around 2 weeks for destinations such as Europe, UK and the Middle East to up to 4 weeks for further destinations such as China.

2.2.1 Cellular vessels/container vessels

Cellular vessels (also known as container vessels) form the backbone of the modern container shipping industry. Their development accelerated after 1965, when the International Organisation for Standardisation (ISO) defined standard container dimensions. This allowed for the global adoption of standardised 6-metre (20-foot) and 12-metre (40-foot) containers, each bearing ISO codes to ensure compatibility with common handling equipment and vessel stowage systems.

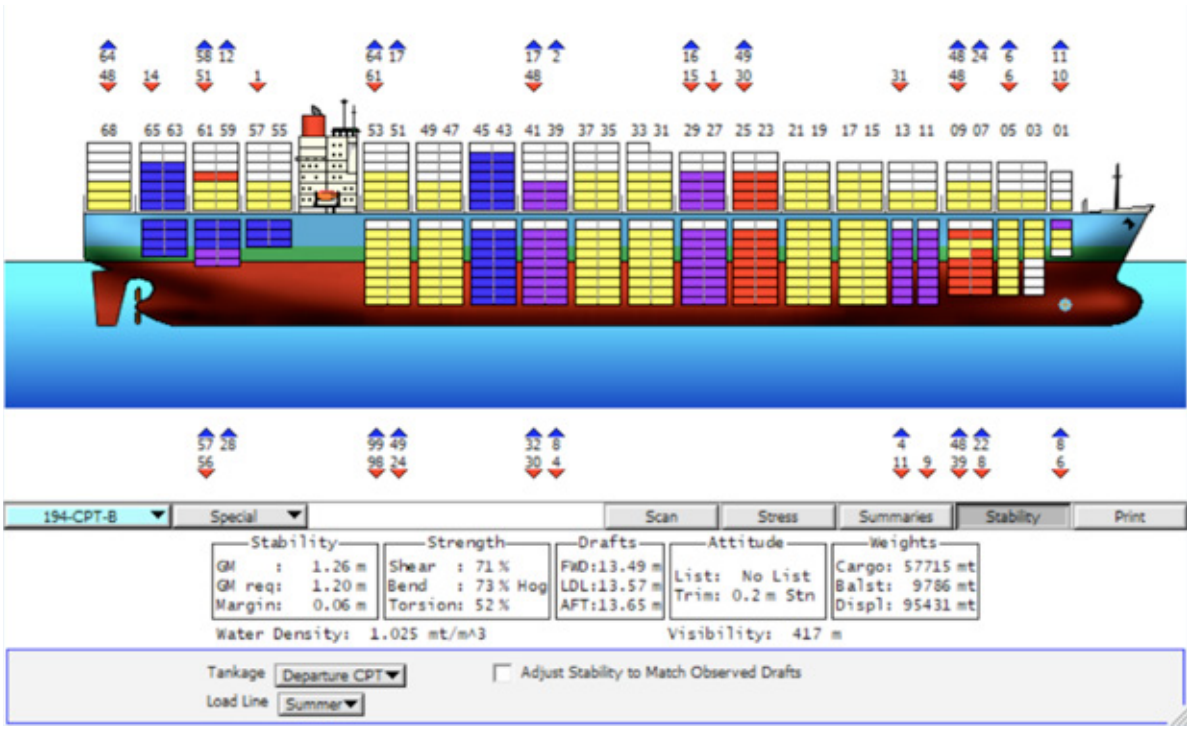
The capacity of cellular vessels is indicated in terms of Twenty-foot Equivalent Units (TEUs), with two TEUs equal to one 12-metre container. Typical cellular vessels operating in South Africa have capacities of 2,500 to 11,000 TEUs, however, globally there are large cellular vessels with capacities of up to 24,000 TEUs.

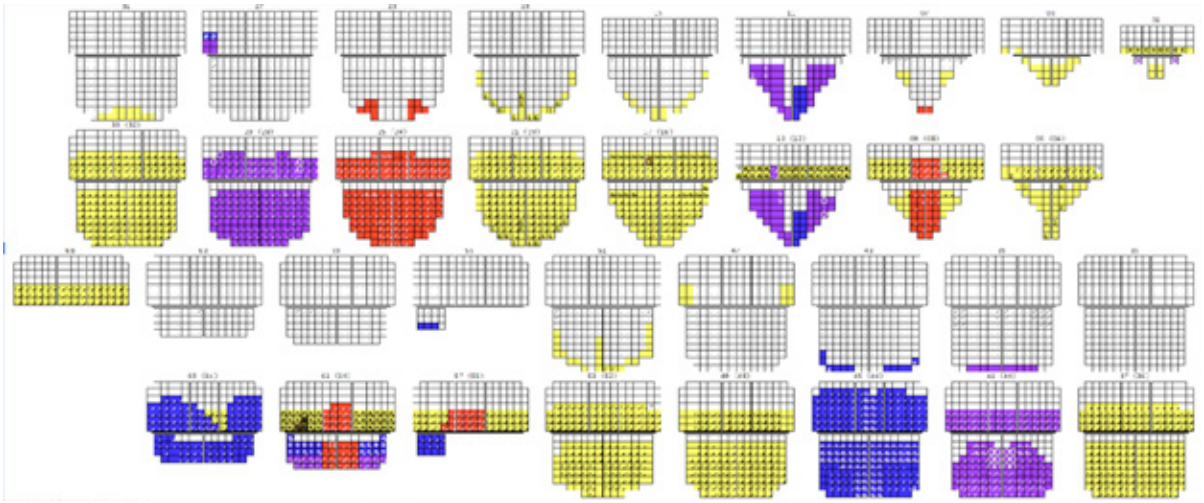
Cellular vessel (photo courtesy of Ocean Network Express)

Key features of cellular vessels include:
- Purpose-built for containers with containers stowed below and above deck.
- Have fixed cell guides in their holds for containers.
- Have plug-in points for reefer containers.
- Optimised for quick turnaround at ports equipped with Ship-to-Shore Gantry Cranes (STC's).
- Operate on scheduled routes with pre-booked berth windows, governed by Container Terminal Operations Contracts (CTOCs). These agreements help minimise waiting time and ensure efficient berthing, loading, and departure.
- Containers below deck are sealed under watertight hatch covers.
- Ventilation below deck is maintained via automated fans that cycle air through each bay, typically at least once a dail, to prevent gas buildup and regulate temperature.

Most vessels (cellular vessels, SRVs and MPVs) run on heavy fuel oil known as **bunker oil**. Since 2020, when legislation was introduced to limit the sulphur content of fuel to limit pollution, vessels were either fitted with scrubbers to clean the exhaust gasses or alternatively vessels need to use more expensive Very Low Sulphur Fuel Oil (VLSFO). Shipping lines charge clients a **Bunker Adjustment Fee (BAF)** which varies according to ruling fuel prices.

Cellular vessels are divided into bays, running side to side across the vessel's width (from port to stern). Each bay can accommodate two 6-metre (20-foot) containers, or one 12-metre (40-foot) container. Each container's location on the vessel is indicated by a six-digit address code indicating the bay, row and tier/level as indicated on the vessel stowage plan as illustrated on the next page.





Container placement is managed by advanced stowage software

Stowage planning and safety

Container placement is managed by advanced stowage software, which considers:

- Port of discharge
- Container type and size
- Cargo weight (Verified Gross Mass) to balance the vessel
- Special handling requirements

The software ensures safe stacking without exceeding the maximum structural load limit of 240 tons per stack. However, human oversight remains critical. Experienced vessel planners' sense-check software outputs, applying operational insight to avoid restows (unnecessary rehandling of containers) and violations of IMDG regulations for dangerous goods (e.g. flammable, toxic, corrosive, or explosive substances).

2.2.2 Specialised Reefer Vessels (SRV)

SRVs (historically referred to as conventional vessels) carry pallets of fruit in refrigerated holds. Newer SRVs also carry containers above deck. Prior to 1975, the year generally accepted as the year container shipping came of age, the conventional way to ship cargo, as it had been or thousands of years was inside large compartments, known as cargo holds, in a ship. SRVs are much smaller than cellular vessels and typically have a carrying capacity of 3,500 to 5,500 pallets below deck, with additional capacity in containers loaded above deck.

SRVs typically have 4 holds, with the number one hold at the fore and number four hold at the aft (rear). Each of these holds typically has four levels, or decks. A, being the top deck and D the lowest deck. If a deck floor is perforated, then it shares the same air flow as the deck beneath. Alternatively, each hold and or deck may have a different temperature regime to accommodate produce with differing temperature requirements. Insulation built into the floors, walls and deckheads, help maintain temperature control. Holds are sealed during transit by large deck lids. Advances in technology and in cargo handling ensure the temperature settings are well controlled, recorded digitally and handling protocols meet required global standards towards achieving an unbroken cold chain.

Fruit being loaded into a SRV at the Port of Cape Town

SRVs have their own cranes serving each hold (ship's gear) while third party stevedores have the job of stowing the fruit. The height of the deckhead, limits the height of the pallets to 1,9m, thus establishing the standard pallet. Consequently, high cube pallets used in reefer containers, cannot be shipped in most SRVs.

All reefer vessels are inspected upon arrival at the port of loading by the PPECB, and must pass stringent sanitation and cargo worthy checks, as well as proof of cold chain integrity, before they are accepted for loading fresh fruit.

Today, only Durban has quayside chilled cross docks for accumulation and buffering of pallets of fruit for SRVs. At Cape Town and Gqeberha ports, fruit for SRVs is dispatched from chilled cross docks outside the port. Upon loading, pallets are placed into cages, or on bolsters attached to the crane hook, which then hoist

them aboard, two or four at a time. Infrared, handheld scanners, manned by third party tally companies, scan pallets upon arrival, checking off against pre-advised cargo notes on the management system. In this process, the pallets are assigned a specific deck/hold, as per the planning schedule. As the pallets move to the quayside, then onto the ship to be stowed, they are scanned by both terminal scan teams and independent tally scan teams. Real time cargo reconciliation enables errors in stowage to be rectified and ensure the correct cargo is allocated for the correct discharge port. Once loading is completed, the vessel provides a **'mates receipt'** for the pallets loaded, by fruit type, temperature regime, deck, hold and discharge port. The vessel also confirms the containers loaded on deck. Note that the term mates receipt should only be used in the case of SRVs. For container shipping the correct equivalent document is the packing list which should not be referred to as a mates receipt.

SRV vessels do not call at more than three ports of loading and no more than two ports for discharge.

2.2.3 Advantages and disadvantages of cellular vessels vs SRVs

	Cellular Vessels	SRVs
Advantages	Door to door delivery of containers without break in cold chain and double handling of pallets	Quicker delivery due to less stops at ports to load and off-load
	More cost-effective shipping rates	More reliable execution of cold treatment protocols
	Able to carry high-cube pallets enabling more cost-effective road freight	Available capacity when cellular vessels are over-subscribed during peak season
		Can load in higher winds
Disadvantages	Typically, slower as they call at more ports	More expensive due to poor economies of scale and old technology
	Cold treatment can be interrupted if technicians on board cannot repair reefer container refrigeration unit breakdowns promptly	Cannot load high-cube pallets. Must load standard height pallets increasing the cost of road freight.

The current fleet of 96 reefer vessels is a fraction of the fleet 20 years ago and as SRVs reach scrapping age, there is little appetite to replace them with new builds. It is therefore likely that the use of SRVs will continue to decline.

3. Ports: Gateways to global trade

A **harbour** is a sheltered body of water that allows ships to anchor safely, protected from rough seas.
A **port** is a developed facility within a harbour where commercial shipping operations take place.
Some countries, such as Costa Rica (Port of Moín) and Singapore, have created ports by reclaiming land from the ocean to support trade infrastructure.The primary function of a port is to facilitate international trade. Ports are considered national strategic assets and are governed by stringent laws to ensure continuous operation - 24 hours a day, 365 days a year. Operations are only suspended in exceptional cases such as severe weather, major accidents, or labour disruptions.
A **terminal** within a port is a designated area where specific types of cargo are handled. It is a sub-facility within the larger port complex, equipped and organised to manage the loading, unloading, storage, and transfer of cargo between ships and other transport modes (like trucks or trains). Examples of types of terminals include container terminals (with or without plug-ins for reefers), bulk terminals for handling products such as grain, minerals, oil or fuel or fresh produce terminals which have cold stores and equipment for handling pallets of fruit for shipment in SRVs.

South Africa has a total of 8 main commercial ports, however only four of these ports have container terminals with a significant quantity of plug-in points for reefers. These are:
• **Cape Town:** 4 terminals
• **Durban:** 8 terminals
• **Gqeberha (formerly Port Elizabeth)**: 4 terminals
• **Ngqura (also referred to as Coega):** 1 terminal
In addition to the above ports some South African fruit is also exported through the port of Maputo in Mozambique which has two primary terminals divided into 6 specialised terminals.


Cape Town port

In contrast, major international ports such as **Antwerp** have 26 terminals (5 of which are privately owned container terminals), while **Hamburg** boasts 75 terminals (including 4 privately owned container terminals).

3.1 Port ownership, operations and security

Ports are secured under international maritime security regulations (ISPS Code). Entry and exit are controlled, and security levies are charged by shipping lines. All cargo entering and leaving South African ports requires **customs clearance** from the South African Revenue Service (SARS).

The ownership and operating structure of South African ports and terminals is centralised under Transnet SOC Ltd, a state-owned logistics company. The **Transnet National Ports Authority (TNPA)**, division of Transnet SOC Ltd, is responsible for providing "wet services," including:
• Breakwater infrastructure
• Navigation and pilotage services
• Tugboats and berthing operations
• Quayside access
Cargo dues are levied on shippers to finance these services. These charges, along with vessel port call fees, are published annually in a tariff book.

All container terminals are currently managed by **Transnet Port Terminals (TPT)**. TPT handles both **quayside operations** (loading and unloading ships) and **landside operations** (container yard management). Tally and stevedoring services are insourced. TPT uses the **Navis SPARCS N4** Terminal Operating System (TOS) to manage container flows. TPT levies **Terminal Handling Charges (THC)** per container for these services. Charges are published annually following stakeholder engagement overseen by the Ports Regulator of South Africa (PRSA).

Some specialised terminals such as the Fresh Produce Terminal in Cape Town and Saldanha iron ore terminal are leased to private operators. However, there are ongoing reforms and pressure to encourage more private investment and improve efficiency, particularly in container terminals. In July 2023, Transnet selected International Container Terminal Services Inc. (ICTSI) - a Philippines-based global terminal operator - as the preferred operator in a 25-year joint-venture to manage and upgrade Pier 2 in the Durban Port, with Transnet Port Terminals retaining majority control. The deal was expected to involve around R11–12 billion in investment but has been delayed through a legal challenge by an unsuccessful bidder.

3.2 Choosing the right port

Exporters consider three key factors when selecting a port:

1. **Proximity to production:** The closer the port is to the packhouse, the lower the transport cost and quicker the delivery time.
2. **Shipping frequency and connectivity:** Access to frequent and well-scheduled shipping routes to key markets is critical.
3. **Port infrastructure, handling capability and service delivery:** Some ports may have better facilities, more shipping lines or provide better service delivery, justifying their use even if they are farther away. For example, exporters in Swaziland and Limpopo often choose Durban over Maputo due to Durban's superior infrastructure and shipping connectivity.

3.3 Reefer container handling in ports

Stacks refer to designated areas where containers are stored temporarily before being loaded onto a vessel or after being offloaded. Containers can only be delivered into port for a specific vessel when stacks are open for that vessel. Stacks open 4 days before vessel arrival and close 1 day prior to berthing. Late arrivals may incur penalties or result in the container being turned away, unless extra stack time is permitted. If capacity of ground slots is available, TPT will invite export cargo to enter for longer than three days. This will reduce gate congestion on the last day of a stack window. No container may remain in the terminal for more than three days before vessel departure. Containers exceeding this limit incur **demurrage charges**, which escalate to discourage long stays. Long-stay containers are transferred by the shipping line to bonded storage facilities at the owner's expense. Stacks are organ ised by discharge port, container type, stowage requirements, and mass. Containers are placed based on Verified Gross Mass (VGM) to ensure stack safety (max: 240 tonnes per ground slot).

TPT targets to place reefer containers on power (plug-in) within 2 hours of the container's gate-in at the terminal while the PPECB's protocols allow a maximum time of 4 hours. Once removed from stack power, reefers must be reconnected aboard the vessel within 2 hours.

When a container arrives at a terminal it is offloaded from the skeletal trailer and placed in stacks using a **Rubber Tyre Gantry Crane (RTG)** or **Straddle Carrier**.

Rubber Tyre Gantry Crane (RTG)

Straddle Carrier

When vessels are loaded RTG's or straddle carries load containers onto a shuttle vehicle (terminal truck with skeletal trailer know in South Africa as a Mafi or bathtub) to transfer the containers to the Ship-to-Shore Gantry Cranes (STC's) for loading onto a vessel.

Mafi with bathtub trailer leaving after delivering container to STC for loading onto a vessel

Shipping lines submit load plans via Navis to TPT planners, who finalise the stowage plan. Vessels are loaded by ship-to-shore cranes (STCs) and stevedore gangs once clearance is received from Border Management. Containers requiring Cold Treatment or Controlled Atmosphere must be stacked in designated groups and loaded on deck in protected positions for easy monitoring and intervention. These are typically placed in the first two tiers above the deck hatch.

If a vessel must meet tight scheduling, it may **omit a port call** or **cut and run**, ceasing operations and sailing before all containers are loaded. This decision lies with the vessel operator, not the terminal. STCs will suspend operations during high winds exceeding 85 kph (a condition referred to as being **wind-bound**).

The Cape Town terminal (1 million TEU capacity) currently has the following equipment:
- 9 ship-to-shore gantry cranes
- 34 rubber-tyred gantries (RTGs)
- 5 four-over-one straddle carriers
- 3 three-over-one straddle carriers
- 3 reach stackers (45-ton capacity)
- 4 empty container handlers
- 45 shuttle vehicles (Mafis/terminal trucks)

Redundancy in handling equipment is required to accommodate maintenance cycles and seasonal surges.

4. Container yard operations

A container yard (CY) is a depot owned or contracted to by the shipping line/s to perform container husbandry services. Empty shipping containers are carefully managed, stored and prepared for transporting dry and perishable goods.

The main functions of a container yard are to:

- Perform pre-trip services and inspections (PTIs) on refrigerated containers,
- clean containers,
- carry out repairs to damaged containers
- store empty containers until they are needed.

Empty container handler moving containers in a container yard

When an empty container is delivered to a CY, it is inspected on arrival. If there is any damage to the container, the operator is informed, and the damaged container is set aside for repairs. Sound containers are placed in the wash bay. Here the inside is washed and sanitised to be food safe while the refrigeration machinery follows a pre-trip procedure to check functionality. Twice a day, a PPECB assessor, inspects the containers presented to them and issues Pre-trip Inspection Certificates (PTI) using their tablets connected to the Titan 2.0 platform. The PTI certificate expires in 30 days for controlled atmosphere containers and 60 days standard reefer containers. The yellow PPECB security seal is placed on the closed container door to remove the risk of contamination and to guard against fraudulent container use. The seal number is recorded on the Titan 2.0 system for control purposes.

Containers passing this process are stacked in batches by build year, new to 5 years, 5 to 10 years and 10 years and older. This makes it easier to pick containers for specific fruit. It is advisable for shippers of more sensitive fruit such as berries, stone fruit, grapes and soft citrus to book shipments specifying containers of new to five years old to ensure the equipment has the latest generation technology and the door seals are still soft and supple. Hardier fruit types are fine with containers up to ten years old and frozen products up to the maximum intended reefer lifespan of 15 years.

Containers are positioned in locations to meet customer demand based on the 4-week rolling forecasts from each customer/shipper. Special equipment like controlled atmosphere and cold treatment equipment requires a minimum of 6-week advance planning to position equipment in the correct location. Shipping line bookings for cold treatment containers are required 10 days before loading for the PPECB to fit and calibrate temperature recorders.

Containers are released by first available in the stack batch and not by specific container number. The first time a container number for a consignment is known is when it is resting on the load bed of the transport truck. The reference number has details of container type, air exchange vent setting and temperature setting. At time of pick-up, the yard staff will set the air exchange vent and temperature required on the release note. This entire process is digital, with exception of the truck driver's Proof of Delivery (POD).

CHAPTER TEN

Freight forwarding and documentation

For ease of reference throughout this chapter, the following terms will be used consistently:
• **Forwarder** refers to the freight forwarder.
• **Shipper** refers to the cargo owner, exporter, or shipper.
• **Carrier** refers to the shipping line.

1. Role of the forwarder

A forwarder acts as an agent on behalf of the shipper and offers a variety of logistics and export-related services. The shipper can choose to outsource selected or all services to the forwarder based on operational needs and their internal capacity. Upon appointment, the forwarder must present a mandate letter from the shipper to every regulatory authority or stakeholder they will engage with on the shipper's behalf. This should be done at the time of engagement and ideally reviewed annually as part of standard business practice.
Forwarders typically operate across four main service areas:

1. Freight forwarding
   Responsible for negotiating and arranging shipping in accordance with the correct Incoterms 2020 (refer to chapter 12 for more detail on Incoterms).
2. Logistics agency
   Arranges chilled cross-dock agreements and transport by road (truck), rail, or container.
3. Customs agency
   Manages all regulatory compliance and customs clearance responsibilities.
4. Freight and service payments
   Makes disbursements on behalf of the shipper.
   Forwarders may also offer value-added services, such as cargo monitoring, container loading supervision, and temperature verification of containers in the port.

1.1 Why use a forwarder?

While fruit marketing companies, grower-exporters, and exporter groupings are often highly skilled in growing, procuring, or marketing fruit, they may lack the in-house expertise required to handle freight logistics, compliance, and customs processes. Further to this, many of these role players may not be big enough to employ full time, skilled staff to handle these functions in-house or have sufficient volume to negotiate competitive rates. For this reason, these entities frequently outsource these functions to one or more forwarders.

Large-scale shippers may appoint multiple forwarders to mitigate risk and leverage route-to-market optimisation. All four forwarder functions require specialised skills and accredited personnel. Forwarders achieve operational efficiency through critical mass: by representing many clients and handling diverse seasonal products year-round, they ensure high staff utilisation and retention of institutional knowledge.

Shippers also expect forwarders to stay current with constantly evolving regulations, especially those concerning the export of fresh food, where regulations are frequently updated. This dynamic regulatory landscape means that virtually all process documents are version-controlled. Working from outdated documents can lead to significant financial and operational consequences. Some large exporters may choose to insource these functions if their volume and spread of work justify full internal control.

1.2 Typical structure of a forwarder

A typical forwarder will include the following divisions and roles:

- Business development
- Shipping coordination
- Customs clearance controllers
- Transport controllers
- Financial controllers
- Key account managers
- Some forwarders deploy multi-skilled staff to handle customs processes end-to-end, while others divide these functions among specialised teams.

2. Regulatory framework and industry integration

With the expansion of global trade and more porous borders, robust regulatory controls and recognised trade credibility are essential. This has led to the development of accreditation frameworks to simplify international business processes. Notably, the COVID-19 pandemic accelerated the shift toward paperless, digital systems. South African industry bodies - including grower organisations, the Department of Agriculture (DoA), SARS, SARB, SACCI, Transnet, and PPECB - now operate integrated platforms that facilitate the digital exchange of regulatory documentation between accredited (trusted) partners. These processes follow a structured and, in many cases, sequential flow. Some actions may occur in parallel, while others must follow a defined sequence. This manual follows that sequence, examining each process in detail to develop a complete understanding.

3. Standard process flow of a consignment

Below is the typical export process for a fresh produce consignment:

1. Appointment of the forwarder/logistics agent prior to commencement of the season
2. Annual pre-season shipping forecast (road, air, sea)
3. Weekly four-week rolling in-season shipping forecast
4. Weekly packing instruction to packhouse
5. Shipping booking
6. Transport booking
7. Loading instruction to cold store
8. Export Notification
9. Packing List (or Mate's Receipt in the case of SRV)
10. SARS Customs Bill of Entry – SAD500 (includes SARB foreign currency declaration)
11. Seller – Customs Invoice
12. Seller – Commercial Invoice
13. Insurance Certificate/Policy
14. DoA Export Certificate
15. PPECB Addendum
16. NPPO Phytosanitary Certificate
17. Certificate of Origin – (SARS or SACCI)
18. Shipping Instruction (SI)
19. TNPA Cargo Dues
20. TPT NAVIS Terminal Entry
21. Bill of Lading / Seaway Bill
22. Letter of Credit (if applicable)

Note that the shipping booking (Booking Note) is the foundational document in the chain. Many subsequent documents derive from it, accumulating additional data such as actual volumes, weights, container and seal numbers. It directly feeds into systems like the Terminal Operating System (TOS), Export Notification, Shipping Instruction, Bill of Lading, and the SAD500.

4. Description of key documents/procedures

Step 1: Appointment of freight forwarder / logistics agent
It is best practice to formally reappoint the forwarder annually. This ensures all mandate letters required by regulatory authorities are up to date, affirming the forwarder's authority to act on behalf of the shipper. This renewal process should ideally be completed before the start of the shipper's financial year. It is also a suitable opportunity to review or amend the scope of services, particularly if there have been operational or route-to-market changes and serves as an opportunity to negotiate rates for the season.

Step 2 & 3: Annual and weekly 4 week rolling shipping forecast (road, air, sea)
The annual shipping forecast should become an embedded operational habit - part of the enterprise's planning DNA. This forecast is foundational to the shipper's relationship with logistics partners across all modes of transport.
When actual shipped volumes closely match forecasted volumes, it builds operational credibility and trust with service providers. Conversely, significant and frequent deviations can damage this trust, leading to more transactional relationships with reduced service levels.

Step 4: Weekly packing instruction to packhouse
The exporter sends a weekly packing instruction to each packhouse with detailed packing instructions including quantities, packaging, product and labelling specifications.

Step 5: Shipping booking (Booking Note)
The shipper provides shipping instructions to the forwarder, who then secures the booking with the carrier. This is done either via the INTTRA platform - favoured for its efficiency and template functionality - or directly through the carrier's proprietary online portal, which is increasingly preferred by shipping lines. Once confirmed, the carrier's ERP system shares the booking details in real-time with the Navis Sparcs IV Terminal Operating System (TOS). Each booking is live on the TOS once the reference number is generated. The Booking Note number encodes carrier identification, load port, cargo type, and a unique control number. This number links through to the Shipping Instruction (SI) and Bill of Lading, forming a critical reference across all stages of the export chain.

Step 6: Export Notification (EN)
The forwarder submits the Export Notification (EN) through the PPECB Titan portal using their secure login credentials. Formerly known as the Q67 form, this is now fully digital. Submission of the EN triggers the Sea Levy, a PPECB service tariff, and enables the deployment of PPECB personnel for container loading supervision.
The PPECB area manager schedules staff based on this notification. Inland loading events are costlier than those at chilled cross-docks near ports. PPECB inspectors attend loading to verify container condition and confirm that pulp temperatures of the fruit are within tolerance. These checks are essential, but the shipper or their representative should also conduct their own inspection as part of due diligence.
Larger cross-dock facilities often have resident PPECB inspectors, while smaller or remote sites require scheduling through the EN. Awareness of the specific infrastructure and inspection setup at each cross-dock used is critical to avoiding delays or non-compliance.

Step 7: Transport booking
The forwarder arranges transport for merchant-haul shipments. For carrier-haul consignments, the carrier handles container transport. Despite being outdated, the Q67 export notification is still widely used by forwarders as a transport booking document due to its compatibility with legacy ERP systems.
At the container yard (CY), the truck driver presents the Q67/Booking Note. The reference number must match the release note issued by the shipping line to ensure the correct container is handed over. Upon

collection, the CY issues a customs seal, which the driver affixes to the container.
The driver relays the container and seal numbers to the transporter's office, which forwards them to the forwarder for use in Terminal Pre-Advice (TPT NAVIS system). Once the truck arrives at the chilled cross-dock, the Q67 is handed over to initiate the loading process.
After loading, the cross-dock staff countersign the Proof of Delivery (POD) document. This serves as both confirmation of loading and a billing trigger for the forwarder.

Step 8: Loading instruction to cold store
The loading instruction serves to advise the cold store which pallets to load into a container for each dispatch.

Step 9: Packing List
Following container loading and sealing, the cross-dock ERP system generates the Packing List.
This document mirrors the Booking Note but includes critical additional details such as:
• Pallet ID numbers
• Container number
• Customs seal number
• Loading start and end times
The Packing List initiates all downstream compliance processes and regulatory submissions.

Step 10: SARS Customs Entry – SAD500
The SAD500 is the official Single Administrative Document (SAD) for customs declarations. It is generated from the forwarder's ERP system and submitted via Electronic Data Interchange (EDI) to SARS. Only accredited customs agents can perform this function using systems like Cargowise, SoftShip, or ShipShape.
The SAD500 enables:
• Trade data collection for statistical purposes
• Foreign exchange tracking
• Cross-border trade compliance under the World Customs Organization (WCO) framework
Once validated, SARS issues a Customs Release Note to the forwarder. Legally, the forwarder must provide this document to the carrier before the Bill of Lading is issued. In practice, this is often overlooked, but it remains a legal requirement.
The SAD500 provides the Ministry of Finance with real-time insights into trade volumes, values, and product categories - contributing directly to GDP calculations. SARS imposes penalties for late or incorrect submissions.

Step 11: Seller – Customs Invoice
This is a regulatory invoice required by the South African Reserve Bank (SARB) for monitoring foreign currency inflows and economic stability. It is distinct from the commercial invoice.
The shipper submits a soft copy customs invoice to the forwarder, listing the Incoterm and named port value. This is the value of the goods at the point of export—excluding freight, insurance, and downstream costs. SARB only requires reporting for values above ZAR 50,000.
Note that many exporters still incorrectly use FOB (Free On Board) for containerised cargo. FCA is the correct Incoterm for this scenario. FOB should only be used for fruit shipped in SRV's.
Each transaction must be linked to a Unique Consignment Reference (UCR) number. This is a mandatory SARB requirement and must be reflected in Block 28 of the SAD500.
A valid UCR must:
• Be 12–24 alphanumeric characters (no spaces/symbols)
• Begin with the year (e.g., "4" for 2024)
• Include "ZA" (S.W.I.F.T. country code)
• Contain the exporter's SARS registration number
• Include a unique transaction code

When shipping fruit on consignment where the sales price is not yet known, a current price estimate is used. Any variance exceeding 10% in declared values must be corrected. SARB imposes penalties for non-compliance.

Step 12: Seller – Commercial Invoice

This is the commercial invoice generated by the shipper to the buyer and is unrelated to customs clearance. Unfortunately, many shippers mistakenly provide this document to the forwarder in place of the customs invoice.

This is not considered negligence but rather a knowledge gap. Forwarders are encouraged to educate their clients to ensure that the correct invoice - the customs invoice - is submitted for clearance.

Step 13: Insurance certificate / policy

Under Incoterms 2020, only CIF (Cost, Insurance & Freight) and CIP (Carriage & Insurance Paid To) require insurance. However, banks or destination countries may still request an insurance certificate as part of the document set.

Typically, this is a simple statement on the shipper's letterhead confirming the insurance provider, policy number, and coverage validity. It is however advisable to always take out marine insurance to manage risks in the logistics chain such as reefer container refrigeration breakdowns or vessel distress.

Step 14: Department of Agriculture (DoA) Export Certificate

The Export Certificate is a formal government-to-government document required by the importing country. It certifies that the exported product meets the agreed quality standards and has been inspected and accredited by an authorised agency.

Although ISO-accredited certification bodies such as SGS and Bureau Veritas (BV) operate in South Africa, the Department of Agriculture has designated the PPECB as the sole accredited inspection agency for issuing this export certification.

Despite common reference to the "PPECB certificate," the actual document bears the official DoA crest and is issued by the DoA, with inspection conducted and certification endorsed by the PPECB.

At pack house level, PPECB inspectors assess the product against bilateral agreements between South Africa and the importing country. The PPECB's Titan system logs these inspections, creating an official record of conformity.

Once a container is packed and the Packing List generated, the shipment data is reconciled with the Titan records. If all parameters meet the export protocol requirements, the consignment qualifies for a DoA Export Certificate.

Step 15: PPECB Addendum to the Export Certificate

Introduced in 2001, the PPECB Addendum supplements the DoA Export Certificate by providing pallet-level detail - specifically, the batch numbers or consignment note numbers assigned during product inspection at the pack line.

This addendum is a fraud mitigation tool, ensuring that each pallet is traceable and cannot be offered for export more than once.

Once Module 4 of the PPECB Titan system goes live in 2025, the packing and shipping data will be fully integrated, rendering this addendum obsolete. Until then, the addendum remains a mandatory document for final export certification.

Step 16: NPPOZA Phytosanitary Certificate

The National Plant Protection Organisation of South Africa (NPPOZA) issues a Phytosanitary Certificate to certify that a consignment meets the pest control and plant health standards required by the importing country.

This is a mandatory government-to-government assurance, issued digitally via the e-Cert module on the Phytclean platform. Before application, the exporter must confirm the product's eligibility by referencing

PUC and orchard numbers on Phytclean.
Phytclean is South Africa's authoritative repository for:
• Orchard and plantation registration records
• Pest status assessments
• Removal permits and plant quarantine inspection results
Once packing is complete and the DoA Export Certificate is issued, the exporter can apply for a Phytosanitary Certificate. If the consignment fails to meet the requirements of the intended market, it may still qualify for export to a destination with lower phytosanitary standards. If not, it must be withdrawn from export.

Step 17: Certificate of Origin (SARS or SACCI)
The Certificate of Origin (COO) proves that a product originates from South Africa and complies with WTO Rules of Origin (ROO).
There are several types of COO:
1. SACCI Certificate of Origin
Issued by the South African Chamber of Commerce and Industry via online application, using the DoA Export Certificate as the base document. Forwarders maintain a prepaid balance in SACCI's portal, from which the certificate fee is deducted. This document is soft copy only, except for countries (mainly in the Middle and Far East) that still require hard copies.
2. EUR.1 Certificate (SARS)
Required for exports to European Union (EU) countries that benefit from preferential trade agreements. EU imports from qualifying countries enjoy reduced tariffs.
Exporters wishing to streamline this process should apply for Approved Exporter (AE) status under SARS Approved Preferential Exporter (APE) programme. Accreditation is done through SARS eFiling under the "Registrations, Licensing and Accreditation (RLA)" tab.
To qualify, exporters must have a minimum of 24 export consignments per year and meet several compliance criteria. Once accredited, exporters can self-certify origin, eliminating the need for a EUR.1 certificate and significantly improving credibility and efficiency.
3. Form A – Russian Federation
Required for exports to Russia under the Generalised System of Preferences (GSP). It is a hard copy certificate confirming South African origin and is couriered to the exporter after application.

Step 18: TPT NAVIS Terminal Pre-Advice Entry
The Transnet Port Terminals (TPT) system, powered by the Navis TOS, already contains Booking Note information for each consignment. However, to complete the pre-advice process and allow container entry to the terminal, the forwarder must submit:
• Verified Gross Mass (VGM)
• Container number
• Customs seal number
This information is typically provided by the driver upon container pick-up at the container yard. The forwarder uses their Navis login credentials to submit the terminal pre-advice, enabling the container to be registered into the port system.

Note on product masses:
All role players must be very careful when it comes to mass declarations.
1. The commercial, marketing team are only concerned with the net mass of the product, because this is the mass the customer pays against, and against which import duties will be levied at destination.
2. The shipping line is only concerned with the cargo mass (pallets, cartons, strapping, dunnage) because this determines the container capacity they need to allocate to a shipper.
3. The export terminal is only concerned with a verified gross mass of the cargo plus the container (VGM), as this determines how and where they will place the full containers in the yard. Vessel planners require this VGM to plan safe stowage on the ship.

Step 19: TNPA Cargo Dues

Transnet National Ports Authority (TNPA) collects Cargo Dues as a port operating fee. The tariff is determined based on:

• TEU size
• ISO container code
• Container status (full or empty)

The forwarder manages these payments through the Cash-to-Order portal, where a pre-funded account is debited per transaction. The system provides alerts when the balance needs topping up.

Payment of Cargo Dues must be completed before vessel departure. Late payments attract penalties and can delay cargo clearance.

Step 20: Shipping Instruction (SI)

Once the Packing List is finalised, the forwarder submits a Shipping Instruction (SI) to the carrier.

The SI includes:

• Booking Note reference
• Container numbers
• Seal numbers
• Verified gross mass
• Any amendments to cargo details

The Packing List serves as the trigger document for this submission. Once submitted, the carrier's ERP system generates a draft Bill of Lading, sent to the forwarder for verification.

Step 21: Bill of Lading / Seaway Bill of Lading

The Bill of Lading (B/L) is a critical document in international shipping, serving as:

• The title deed of the goods
• The contract of carriage

After reviewing the draft B/L, the forwarder submits any necessary changes or confirms approval.

The carrier issues the final Bill of Lading once all commercial and regulatory requirements (including payment terms) are met.

There are two main types:

Original Bill of Lading – Required for physical release of cargo at destination.

Express Bill (Seaway Bill) – Used in trusted relationships. No original documents are required for release; the B/L number alone is sufficient.

Step 22: Letter of Credit (LC)

A Letter of Credit is a financial instrument used in two primary scenarios:

1. When required by the importing country's revenue authority (e.g. Bangladesh)
2. When the exporter needs assurance of payment*

The importer nominates a corresponding bank, which secures the transaction value and facilitates payment based on agreed supply terms.

Once the Bill of Lading is issued, the bank:

• Calls for freight and documentation fees
• Takes possession of the three original Bills of Lading
• Ensures cargo is released only after final payment

The bank then transfers funds to the exporter and releases the consignment to the importer.

*It must however be noted that LC's are not commonly used in the fresh produce industry other than when required by the importing country as fresh produce often has quality claims making assurance of payment difficult to administer by means of LC's. In the fresh produce trade pre-payment and Credit Guarantee Insurance are more commonly used to manage payment risk.

5. World Customs Organization (WCO) – Approved Economic Operator (AEO)

The AEO accreditation programme, administered under the WCO SAFE Framework, is designed to recognise and validate ethical trade practices.

Key areas evaluated include:

- Data accuracy
- Information retention
- Cybersecurity protocols
- Internal control systems

Accreditation is completed through SARS eFiling under the RLA (Registration, Licensing & Accreditation) module.

There are two AEO levels (Level I and Level II), and although currently voluntary, accreditation is expected to become mandatory in the near future. Achieving AEO status enhances international credibility and streamlines customs interactions.

Accreditation can take 3 months to 2 years, depending on the applicant's resources, preparedness and commitment to compliance.

Busy port at sunrise

CHAPTER ELEVEN

Global Markets

1. Consumers and market dynamics

For South African fruit exporters, understanding consumer dynamics is essential to navigating the complex global fresh produce trade. Consumer behaviour, combined with fluctuating supply and demand, directly influences pricing, market access, product positioning, and long-term competitiveness.

At the core of global pricing is the interplay between **supply and demand**. When South Africa enters the market during the northern hemisphere off-season, demand for counter-seasonal fruit often results in higher prices and stronger margins. However, oversupply - whether due to strong South African export volumes, overlapping export windows, local production in target markets, or competing suppliers like Chile, Peru, or Egypt - can quickly depress prices. Real-time market intelligence and coordinated supply management are therefore critical to optimise returns and avoid gluts.

Premium retail fresh produce environment

Consumer segmentation across global markets is becoming increasingly tiered, both between and within countries. In higher-income markets such as Western Europe, North America, and parts of Asia, consumers prioritise taste, appearance, ethical sourcing, environmental sustainability, and convenience. These markets demand premium varieties, consistent sizing, extended shelf life, and certified compliance. Within these markets, further **tiering** exists at the retail level: **discounters** (e.g. Aldi and Lidl) prioritise value-for-money, while **premium retailers** (e.g. Marks & Spencer, Whole Foods) focus on factors such as product innovation, quality, convenience, ethical sourcing and environmental footprint.

By contrast, in **lower-income or developing markets, price sensitivity is higher**. Consumers often purchase smaller quantities through informal or traditional channels, placing greater emphasis on affordability, basic quality, and freshness rather than certifications or packaging aesthetics. Exporters must tailor packaging formats, shipping strategies, and product grades to meet these more price-sensitive segments.


African informal market fresh produce environment

Consumer preferences also vary widely by market and culture. For apples in Asia, for example, sweet taste profiles and smaller fruit sizes are often preferred, while in Europe, larger fruit with slightly more acidic flavour profiles are often preferred. Some regions prefer traditional varieties, while others are open to novel cultivars or new eating experiences. Exporters who understand and align with these preferences can tailor their supply and market profile to optimise market access.

A foundational requirement across all markets is meeting both **legislated and buyer compliance** standards, including food safety, traceability, and phytosanitary protocols. Markets such as the EU, UK, USA, and China maintain stringent maximum residue limits (MRLs), documentation, and cold treatment protocols. Retailers further layer in private standards related to social compliance, sustainability, and packaging. Non-compliance can lead to port rejections, delisting, or reputational damage, making continuous investment in compliance systems non-negotiable.

For South African fruit exporters, **diversifying sales across multiple countries and buyers** is essential to effectively manage market risk and optimise returns across all fruit grades and varieties. Relying too heavily on a few markets and/or receivers exposes exporters to risks such as oversupply conditions, economic downturns, sudden regulatory changes, currency volatility, or geopolitical disruptions that can impact demand, pricing or market access. Diversification ultimately supports more stable income streams and improved long-term competitiveness.

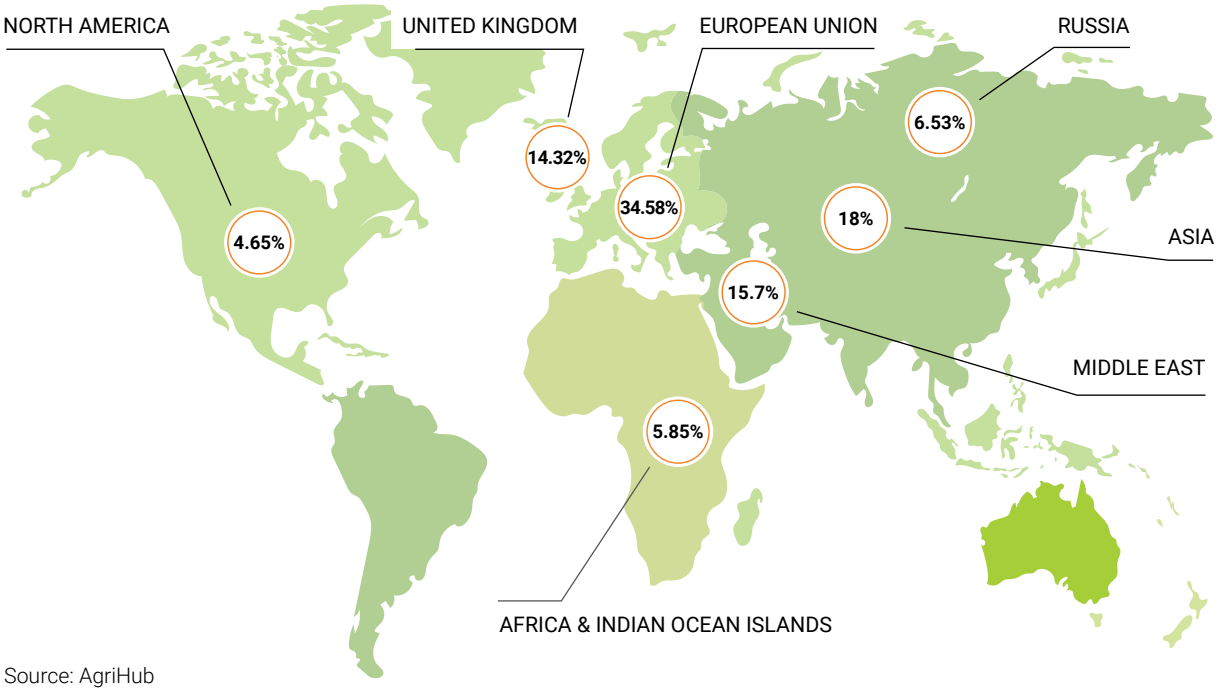
Amidst increasing global competition, South African exporters have the **opportunity to differentiate** through product and service excellence. This includes offering premium varieties, innovative packaging, extended availability windows, or integrated marketing support. High service levels - such as on-time delivery, accurate forecasting, flexible order fulfilment, and transparent communication are vital to secure buyer loyalty and trust.

2. Overview of South African key export markets

As highlighted in chapter 1, South Africa has become one of the biggest producers and exporters of fruit in the southern hemisphere. The southern hemisphere's fruit production season is counter seasonal to the northern hemisphere, enabling the southern hemisphere to supply fruit to the northern hemisphere during its off season. Approximately 90% of the world's population lives in the northern hemisphere, providing southern hemisphere fruit exporters with excellent market opportunities.

South Africa has been able to develop its markets so that it now exports to over 100 countries around the world. The map below shows the different continents to which South Africa exports its fresh fruit. In this chapter we provide an overview of key export markets.

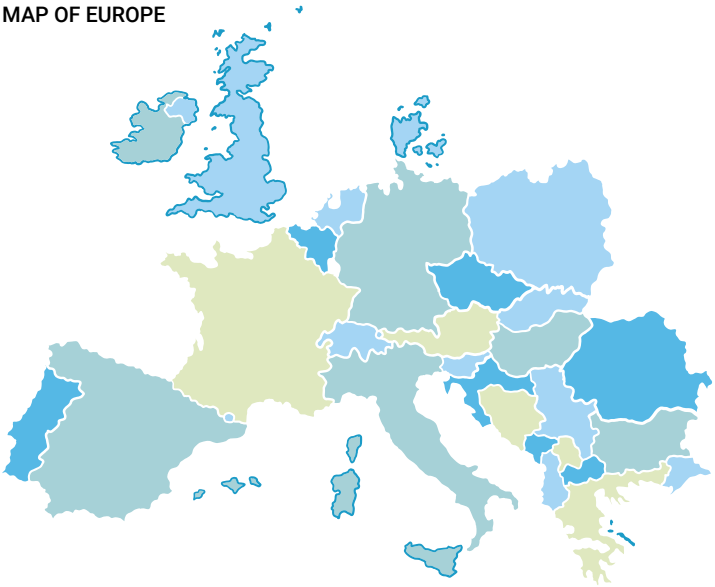
SOUTH AFRICAN EXPORT MARKETS 2023/24 SEASON



Source: AgriHub

2.1 Europe

MAP OF EUROPE



Europe remains a vital destination for South African fresh fruit exports. With a population of over 670 million, the region encompasses a diverse range of countries, from highly developed Western and Northern European states (such as Germany, France, the Netherlands, Belgium, and Scandinavia) to the emerging markets of Eastern and Southern Europe (such as Poland, Romania, and Spain). While overall economic growth is moderate, most of Western and Northern Europe enjoys high levels of consumer spending power, driven by a well-established middle class. Political and social stability in the EU bloc and the Schengen area creates a relatively predictable and secure trading environment, though regional tensions and economic disparities persist in parts of Southern and Eastern Europe.

Fruit and vegetables in Carrefour in France

The fresh produce market in continental Europe is sophisticated and highly organised. Informal markets are minimal. The trade structure is still strongly influenced by formal wholesale markets (e.g. Barendrecht Fresh Produce hub in the Netherlands, Rungis in France, Mercabarna in Spain), large-scale retail chains, food service (hotels, restaurants, and catering), and industrial processors. Retail is the most important channel, led by powerful supermarket groups such as Carrefour (France), REWE (Germany), Albert Heijn (Netherlands) Aldi and Lidl (traditionally German discounters but now spread throughout Europe). These retailers often source directly or through centralised procurement offices and specialised importers. Prominent fresh produce importers and distributors include Greenyard (Belgium), Total Produce (Netherlands), and SanLucar (Spain/Germany), among others. Prices in the European market are strongly influenced by supply and demand dynamics often mirroring the price trends on the big fresh produce markets. South Africa competes mainly with other southern hemisphere producers such as Chile, Peru, Argentina, and increasingly with north African suppliers like Morocco and Egypt. These countries offer overlapping seasonal availability in categories like citrus, grapes, and stone fruit. South Africa maintains several key competitive advantages: a mature and well-regulated export sector, longstanding trade relationships with EU-based buyers, a reputation for reliable quality, and counter-seasonal supply that complements European production cycles. Its access to the European market is also supported by the Southern African Development Community (SADC)–EU Economic Partnership Agreement, which provides tariff-free entry for most fresh fruit categories.

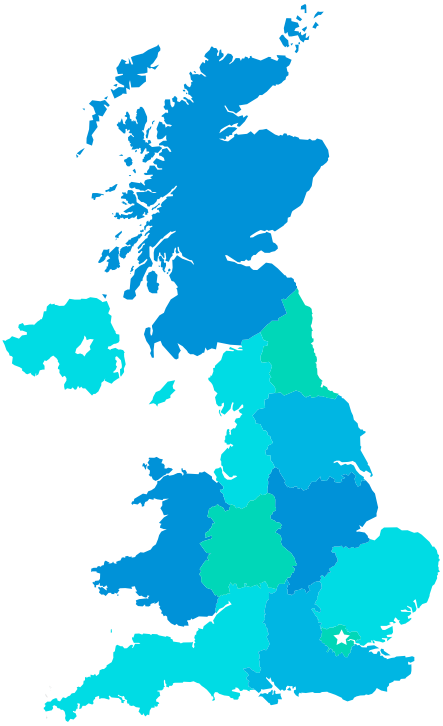
European Union member states impose some of the strictest food safety, ethical, and environmental requirements in the world. Certification standards such as GlobalG.A.P and SIZA are essential for accessing major retailers and even many wholesalers. Trends are increasingly shaped by consumer demand for sustainability, including reduced pesticide use, climate-conscious farming, responsible packaging, and fair labour practices. South African exporters are expected to meet these standards consistently and transparently to maintain market access and build long-term customer trust.

The ease of doing business with the EU is generally high. The EPA ensures favourable market access with no duties on most fruit categories. Nevertheless, non-tariff barriers such as phytosanitary controls, MRL (Maximum Residue Level) compliance, traceability documentation, and quality inspections are stringent and closely monitored. Europe's world-class port infrastructure, advanced cold chain logistics, and efficient inland transport networks support reliable distribution, though congestion and labour issues in some ports can occasionally cause delays. Risk of payment default is relatively low when dealing with established EU buyers, but exporters must still perform careful due diligence and, where appropriate, use secure payment instruments or credit insurance.

2.2 United Kingdom

The United Kingdom (UK) remains a strategically important market for South African fruit exporters. With a population of approximately 67 million, the UK is highly urbanised, with the majority of consumers living in cities and metropolitan areas. While economic growth has been sluggish in recent years due to post-Brexit adjustments, inflationary pressures, and global economic uncertainty, consumer spending power remains relatively strong, particularly in the middle- and upper-income segments. The UK enjoys socio-political stability and a robust legal system, providing a predictable business environment, though political fragmentation and cost-of-living challenges have created some volatility in consumer confidence and retail behaviour.

MAP OF THE UNITED KINGDOM



The UK fresh produce market is mature and highly consolidated. There is minimal informal trade. Retail dominates the market, with supermarkets such Tesco, Sainsbury's, Asda, Morrisons, Aldi and Lidl controlling the majority of fresh fruit sales. Premium retailers such as Marks & Spencer and Waitrose also play an influential role, particularly in the high-end and ethically sourced segments. Fresh produce is typically procured through specialised importers and Category Managers, such as Greencell, Minor, Weir & Willis, Empire World Trade, and Munoz, who act as intermediaries between overseas producers and UK retail and foodservice buyers while some retailers also buy direct from larger suppliers. The wholesale market, represented by centres such as New Covent Garden Market (London), supports independent retailers, restaurants, and caterers but plays a lesser role in volume terms. The HORECA (hotel, restaurant, and catering) sector, while significant, is still recovering from the pandemic's impact and remains secondary to retail in fresh produce volume. The UK market tends to have relatively stable prices driven by the retailers. South Africa's main competitors in the UK fruit market include Chile, Peru, Spain, Morocco, and Egypt - all of whom supply overlapping categories like grapes, citrus, and pome fruit. South Africa retains competitive advantages in terms of established trade relationships, consistent quality, counter-seasonal production, and the ability to ship high volumes efficiently. The UK's historic trading ties with South Africa and the presence of long-standing importer-exporter partnerships further strengthen market access. Additionally, South Africa benefits from the UK-Southern Africa Economic Partnership Agreement (SACUM-UK EPA), which preserves duty-free access post-Brexit.

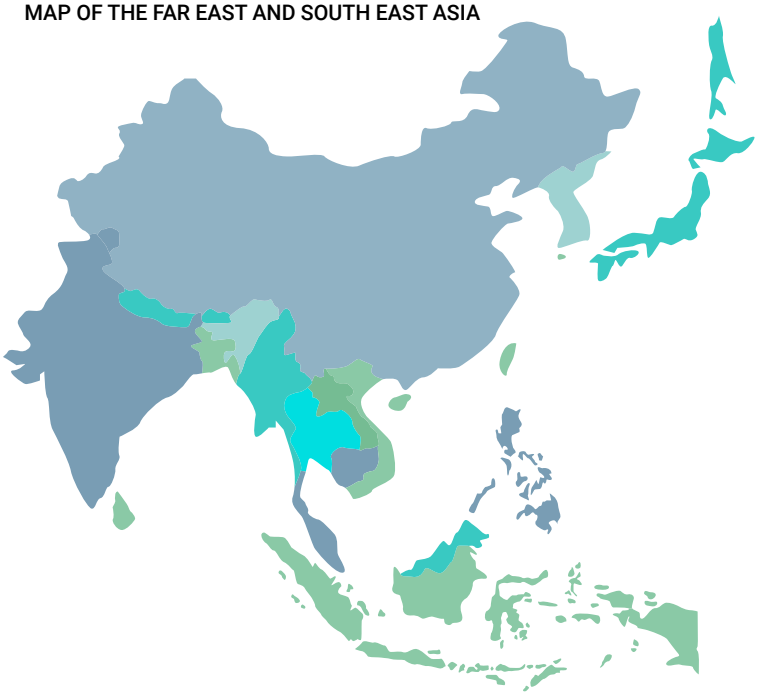
Loose packed fruit in Tesco in London

The UK enforces strict food safety, social, and environmental standards. Compliance with GlobalG.A.P., Sedex (SMETA), SIZA, BRC, and increasingly with LEAF Marque and carbon footprint disclosures, is critical, particularly for retail supply. Ethical sourcing and environmental sustainability have become major consumer concerns, with retailers under pressure to ensure transparent supply chains, low pesticide residues, and responsible labour practices. Social compliance audits and third-party certifications are standard procurement requirements.

In terms of ease of doing business, the UK offers a well-developed infrastructure, efficient logistics, and transparent legal and payment systems. Major ports such as London Gateway, Tilbury, and Felixstowe provide reliable entry points for containerised fruit. Tariff barriers are minimal under the SACUM-UK EPA. Risk of payment default is generally low when dealing with reputable UK importers, but exporters should still practice due diligence and consider credit insurance for new or high-risk customers.

2.3 Far East and South East Asia

MAP OF THE FAR EAST AND SOUTH EAST ASIA



The Far East and South East Asia represent dynamic and fast-growing regions for South African fruit exports. Collectively, the region is home to over 2.5 billion people, with major economies including China, Japan, South Korea, Vietnam, Thailand, Malaysia, Indonesia, and Singapore. These countries vary widely in economic maturity and consumer profiles. China, South Korea, and Japan are advanced economies with high consumer spending power and large urban populations. Meanwhile, Southeast Asia, led by countries such as Vietnam, the Philippines and Indonesia, is experiencing rapid urbanisation, population growth, and the emergence of a strong middle class. While political stability varies by country, overall the region is marked by increasing economic integration, rising consumer demand for healthy food, and improved regulatory environments.

The fresh produce market across these regions is highly diverse. Informal and traditional markets remain significant in countries like Vietnam, Thailand, and Indonesia, particularly for local fruit. However, modern trade channels are expanding rapidly. Wholesale markets such as Guangzhou Market (China), Ota Market (Tokyo), and Pasir Panjang Wholesale Centre (Singapore) remain key for fruit imports, acting as redistribution hubs for traders, retailers, and foodservice buyers. The retail sector is growing quickly, led by international and regional supermarket chains such as Vanguard (China), AEON (Japan & Malaysia), Lotte (South Korea), and Carrefour (Indonesia, Taiwan). E-commerce and online grocery platforms are also growing rapidly, particularly in urban China. The hotel, restaurant, and catering (HORECA) sector plays a prominent role in developed markets like Singapore, Hong Kong and Japan, where premium and niche fruit segments thrive.

Yau Ma Tei Fruit Market in Hong Kong

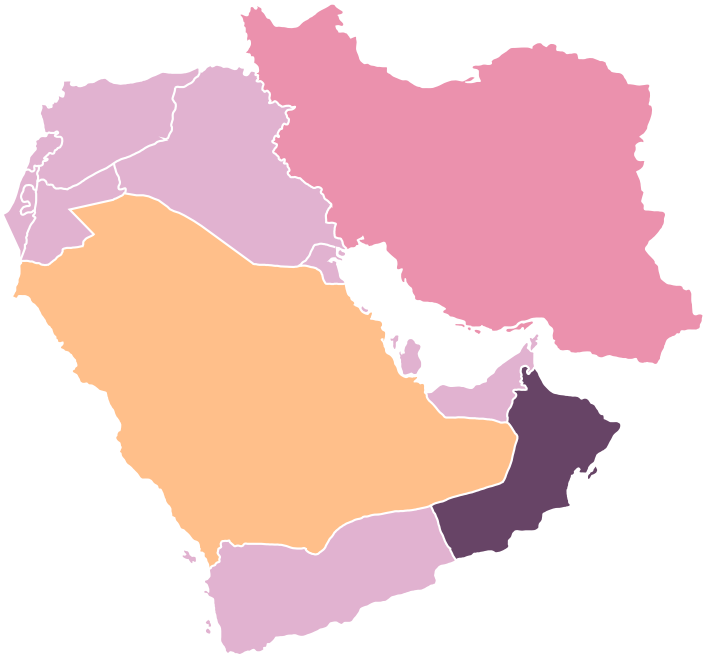
South Africa faces strong competition from Chile, Peru, Australia and New Zealand. However, South Africa retains a competitive edge in citrus, pome fruit, and table grapes due to counter-seasonal availability, good varietal mix, long-standing export experience, and well-established cold chain and shipping routes to Asia. South Africa is also seen as a trusted supplier in markets like China, India, and Malaysia due to its strict export protocols and commitment to quality.

Food safety and certification requirements vary significantly across the region. In less regulated markets, the emphasis may be more on price, appearance, and consistent supply than formal accreditation. However, the overall trend across Asia is toward stricter import controls, improved food safety standards, and growing consumer awareness of ethical and environmental issues.

The ease of doing business in Asia is mixed. Countries like Singapore, Japan, and South Korea offer efficient ports, stable logistics, and low risk of payment default. In contrast, markets such as India, Indonesia, and the Philippines may pose challenges around bureaucracy, non-tariff barriers, slower port clearance, and credit risk. Tariffs vary by product and destination, and while South Africa benefits from bilateral protocols and preferential access in some cases (e.g., China for citrus), market access is still constrained by phytosanitary protocols in several countries. Payment risk is manageable in established markets but can be higher in emerging economies, making vetting and prepayment in high-risk markets advisable.

2.4 Middle East

MAP OF THE MIDDLE EAST



The Middle East is a strategically important and growing market for South African fruit exports. The region encompasses the Arabian Peninsula (including Saudi Arabia, the United Arab Emirates (UAE), Oman, Kuwait, Bahrain, and Qatar), the Levant (notably Jordan and Lebanon), and parts of Iraq and Iran. With a population exceeding 270 million, the region shows significant diversity in terms of income levels and development. Economies like the UAE, Qatar, and Saudi Arabia boast high GDP per capita and strong consumer spending power, while others such as Jordan and Iraq are more price-sensitive. The region is rapidly urbanising, with a young, tech-savvy population and a growing middle class that values healthy, convenient, and premium food options. Socio-political stability varies, while the Gulf states remain relatively stable, parts of the Levant and Iran are more volatile.

The fresh produce market is import-dependent due to limited local agricultural capacity caused by water scarcity and climate conditions. Wholesale markets remain central to distribution, especially in Saudi Arabia and Jordan, where traditional trading still dominates. However, modern retail and HORECA (hotels, restaurants, catering) segments are growing quickly, especially in the UAE, Qatar, and Saudi Arabia. Retail chains such as Carrefour (operated by Majid Al Futtaim), Lulu Hypermarket, Spinneys, Choithrams, Danube, and Panda play a major role in fruit distribution, sourcing both directly and through importers. Specialised importers and distributors such as Fresh Fruits Company (Dubai), Kibsons, Barakat, and NRTC facilitate market entry, particularly for premium or branded produce.

South Africa faces competition from Chile, Egypt, India, Iran and Turkey depending on the fruit category. For citrus, Egypt and Turkey are major rivals, while India and Iran compete in table grapes. South Africa's competitive advantage lies in its reliable cold chain, consistent quality, strong citrus program, and established trade relationships. Its geographic positioning allows for competitive shipping times, especially to Gulf countries, and the country is recognised as a trusted and professional supplier.

Spinneys Dubai.

While food safety compliance requirements are increasing in countries like the UAE, Saudi Arabia, and Qatar, social, ethical trade and environment certifications are generally not required. In general, the region remains far less demanding in this area than Europe or the United Kingdom.

In terms of ease of doing business, the Gulf states offer modern infrastructure, reliable port facilities (e.g.Jebel Ali, Dammam, Doha), and efficient cold storage networks. Customs and regulatory processes are generally well-structured, although documentation must be precise, and delays can occur without strict compliance. Most South African fruit enters duty-free or at low tariffs due to bilateral or trade bloc agreements. Non-tariff barriers can include labelling requirements, shelf-life restrictions and product-specific quality standards. Payment risk is moderate; reputable importers in the UAE and Qatar generally maintain good records, but in less formal or smaller markets, exporters should secure payments in advance or use credit insurance.

2.5 Russia

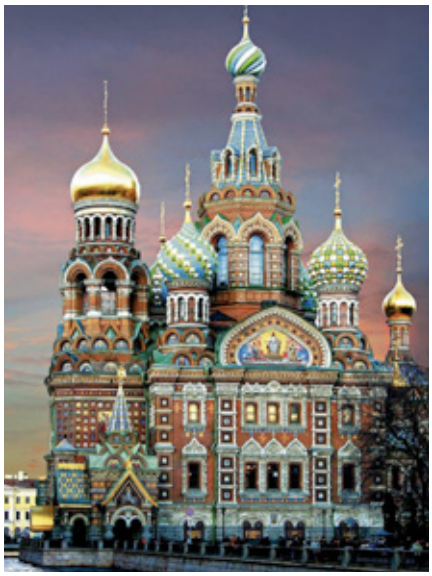
MAP OF RUSSIA

Russia, the largest country in the world by land area, spans both Eastern Europe and Northern Asia and has a population of around 144 million. The majority of the population is urbanised, with major cities like Moscow and St. Petersburg acting as economic and consumer hubs. The economy has faced sustained pressure due to international sanctions, fluctuating energy prices, and geopolitical instability - particularly following the Ukraine conflict - leading to slower growth and limited consumer confidence in some segments. Nonetheless, a resilient middle class remains, with continued demand for imported goods, especially in large urban centres. While socio-political conditions are relatively stable domestically, international relations and currency volatility impact the trade environment.

Russia is heavily dependent on fruit imports due to a limited local growing season and climate constraints. The wholesale market plays a central role in distribution, particularly via hubs like the Food City Market in Moscow, the country's largest agro-cluster. This market supplies both formal and informal trade channels, including smaller retailers and open-air markets, which remain important, especially in rural areas. Modern retail has grown rapidly in recent years, dominated by supermarket chains such as X5 Retail Group, Magnit, Lenta, and Auchan Russia. These chains source through established importers and distributors who

manage customs clearance, logistics, and local market distribution. The HORECA sector - though smaller than in Western Europe - has shown steady recovery, especially in larger cities.

South Africa faces strong competition from Turkey, Iran, Egypt, China, and Argentina, all of which supply fruit at competitive prices. Due to Western sanctions, traditional suppliers from the EU and the US are restricted or banned, creating opportunities for other exporting nations, including South Africa. South Africa's strengths lie in its consistent supply of high-quality citrus, apples, pears, and table grapes, as well as its established reputation for cold chain management and compliance with phytosanitary protocols. The seasonal counter-flow to northern hemisphere production further strengthens its positioning.



Church of the Saviour, St Petersburg Russia

South African exporters must adhere to phytosanitary protocols, product registration, and residue limits, but social and environmental certifications are not yet widely demanded in this market. Instead, focus is placed on shelf life, appearance, and price competitiveness.

Doing business in Russia comes with both opportunities and challenges. On the positive side, Russia does not impose significant tariff barriers on most South African fruit, and logistics channels - particularly via the Black Sea and Baltic ports or overland routes through Belarus - are well established. However, non-tariff barriers, including complex documentation requirements, occasional border delays, and unpredictable inspections, can create inefficiencies. Currency risk and payment default concerns are higher than in other regions due to banking restrictions, exchange rate fluctuations, and limited access to global financial systems. Pre-payment or secured transactions are often recommended.

2.6 Africa and the Indian Ocean Islands

Africa and the Indian Ocean Islands of Mauritius and Réunion, presents a growing yet diverse opportunity for South African fruit exporters. The African continent is home to over 1.4 billion people, with significant regional variation in economic development and consumer behaviour. East Africa (Kenya, Tanzania, Uganda), West Africa (Nigeria, Ghana, Côte d'Ivoire), and Southern Africa (Namibia, Botswana, Zambia, Mozambique) are key subregions. Rapid urbanisation, a growing middle class, and increased demand for safe and convenient food options are driving formal retail growth, though informal markets still dominate in many countries. Economic growth is uneven, with some economies experiencing political instability or currency volatility, while others, like Kenya, Ghana, and Rwanda, show strong reform-led growth. Mauritius and Réunion have smaller but higher-income consumer bases and stable political environments.

MAP OF AFRICA AND THE INDIAN OCEAN ISLANDS

The fresh produce market in Africa is primarily informal, with traditional open-air markets accounting for the majority of fruit sales. However, formal retail and wholesale segments are expanding, particularly in urban centres. Retail chains such as Shoprite, Pick n Pay, Game, Carrefour (in Kenya and East Africa) and Spar have expanded their presence, sourcing fruit both locally and through importers. In the HORECA sector, premium hotels and restaurants in cities such as Nairobi, Accra and Dar es Salaam are demanding higher-quality imported fruit. Importers and distributors, such as Freshmark (Shoprite's procurement arm) and independent traders, play a critical role in moving South African produce into regional markets.

African informal market

South Africa's main competitors in these regions are Egypt, Morocco, Spain, and China, with increasing volumes also coming from local producers, particularly in East and West Africa. However, South Africa's proximity, logistical advantage, high standards, and broad product range - including citrus, apples, pears, grapes, and stone fruit - offer a significant competitive edge. In addition, long-standing trade relationships, established road and sea freight routes, and consistent supply reliability reinforce South Africa's position as a preferred supplier.

On the African mainland, while formal retail and HORECA sectors increasingly require some level of certification and traceability, informal markets typically do not. There is limited demand for social and environmental certifications outside premium retail, although awareness of food safety is increasing across the continent. The ease of doing business varies significantly by country. South Africa benefits from duty-free or low-tariff access to many African countries through regional trade agreements such as SADC and COMESA. However, non-tariff barriers - such as delays at border posts, inefficient customs procedures, currency restrictions, inconsistent enforcement of standards and corruption - can create friction. Logistics infrastructure is uneven; ports such as Maputo, Mombasa, and Dar es Salaam and inland routes into Namibia, Botswana, and Zimbabwe offer relatively efficient access, but cold chain limitations and transport costs can be constraints. Payment risk is moderate to high, particularly with smaller or informal buyers; advance payment or secured terms are recommended.

2.7 North America

North America, comprising the United States and Canada, is a high-value, well-regulated, and mature market for fresh fruit, with a combined population of over 370 million. Both countries have stable political environments, advanced economies, and high levels of urbanisation and consumer spending power. Consumer trends include a growing demand for healthy, sustainably sourced, and convenient foods, a shift towards premium and organic produce, and a strong focus on food traceability and safety. While economic growth has moderated in recent years, consumer demand for quality fruit remains resilient, particularly in affluent metropolitan areas across the East and West Coasts of the U.S. and major Canadian cities such as Toronto, Vancouver, and Montreal.

The fresh produce market in North America is highly structured and formalised. Retail is the dominant channel, led by national chains such as Walmart, Kroger, Costco, Whole Foods (Amazon), Loblaws (Canada), Sobeys and Trader Joe's. These retailers source through large importers and distributors, including Dole, Del Monte, Oppy, Capespan North America and Sunkist, who manage sourcing, logistics, and compliance. Wholesale markets (e.g., the Hunts Point Terminal Market in New York or Ontario Food Terminal in Toronto) serve regional distributors, independent grocers and the HORECA (hotels, restaurants, catering) sector,

which is significant in urban areas. There is virtually no informal market in either country.

MAP OF NORTH AMERICA

South Africa faces competition from Chile, Peru, Mexico, Argentina, New Zealand, and domestic U.S. production, especially in summer fruit and grapes. South Africa's competitive advantages include excellent product quality, rigorous compliance with phytosanitary standards, efficient cold chain systems, and long-standing trade relationships with North American importers. However, South American suppliers such as Chile, Argentina and Peru have a significant advantage over South Africa given their proximity providing quicker and cheaper logistics routes.

Food safety is a critical requirement in the U.S. and Canada. Certification schemes such as GlobalG.A.P. are standard. There is also growing interest in sustainability, ethical sourcing, and social responsibility, although formal requirements for social or environmental certifications are not yet as widespread as in Europe. Retailers and foodservice buyers are increasingly seeking transparency across the supply chain.

Hunts Point Terminal Market in New York

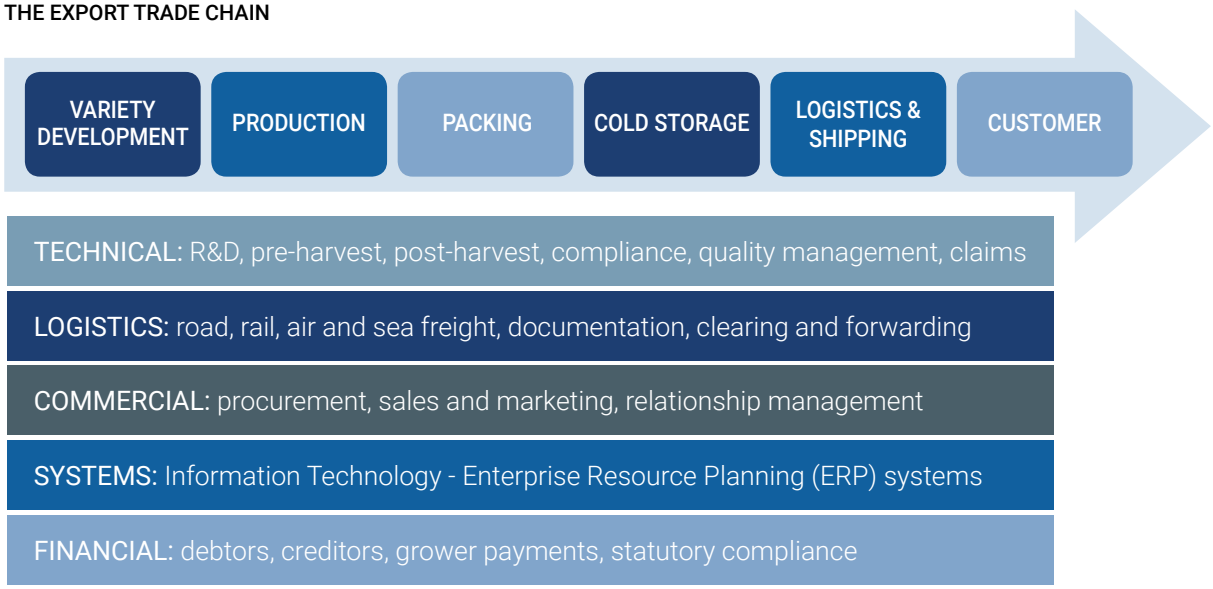
In terms of ease of doing business, both countries offer advanced infrastructure, efficient ports, and stable logistics networks. Entry into the U.S. market requires compliance with USDA-APHIS phytosanitary protocols, including access approvals for each commodity and production region. Canada has similar regulatory processes managed by the Canadian Food Inspection Agency (CFIA). South African citrus currently has access to the U.S. East Coast through cold-treatment protocols and to Canada through established bilateral agreements. Historically South Africa enjoyed duty free access to the US market through the AGOA treaty however recent import tariffs, currently set at 30%, are a threat to South African supply. Non-tariff barriers, such as documentation accuracy, MRL compliance, and cold-treatment verification, are strictly enforced. Payment risk is low, especially when dealing with major buyers and established importers.

CHAPTER TWELVE

Exporters and their role in the trade chain

Export agents are central to the export trade chain, playing a crucial role in coordinating and executing many of its functions. Depending on the size of the exporter, various functions may be insourced or outsourced. Regardless of the approach, it remains the exporter's ultimate responsibility to ensure that all functions are effectively coordinated to meet both legislative and customer requirements. At the top of the diagram below, the overall flow of the trade chain is illustrated - from variety development through production, packing, cold storage, and logistics, to final delivery to the customer. Beneath this, the key roles fulfilled by export agents are categorised into five functional areas: technical, logistics, commercial, financial, and systems.

THE EXPORT TRADE CHAIN



The exporters role in the trade chain

Although many of these functions have been discussed in detail in earlier chapters, we will begin with a brief overview of the exporter's role in each category. This will be followed by a more detailed examination of the exporter's commercial responsibilities in the remainder of the chapter.

1. Technical

The technical aspects of the export process can be broadly divided into three categories: research and development (R&D), pre-harvest technical (horticulture/agronomy), and post-harvest technical (quality management, claims, and compliance).

Some exporters are directly involved in R&D activities such as packaging innovation, post-harvest quality management research, and variety development or evaluation. Others, while not directly engaged in R&D, stay informed about the latest advancements and adopt new technologies across the value chain to remain competitive. It is also common for exporters to secure exclusive or semi-exclusive access to proprietary varieties as a means of market differentiation.

In the pre-harvest phase, many exporters employ horticulturists or agronomists who provide guidance to growers within their supply base. This includes advice on crop preparation for export and ensuring compliance with market-specific regulations, such as the use of approved agrochemicals and adherence to maximum residue limits (MRLs). As compliance requirements vary between markets, exporters are responsible for staying updated on these regulations, communicating them effectively to growers, and verifying grower compliance.

In the post-harvest phase, most exporters have technical teams who work closely with packhouses to ensure that fruit is packed in accordance with customer specifications and regulatory standards. These teams also liaise with customers to understand their quality and compliance expectations. In the case of claims, they assess the validity of claims, implement corrective actions, and relay relevant information to growers.Additionally, post-harvest technical staff collaborate closely with commercial teams to align product specifications with customer needs, ensuring the right product reaches the right market.

2. Logistics

As outlined in detail in the logistics chapters of this book, regardless of whether exporters insource or outsource logistics functions, they remain ultimately responsible for coordinating the movement of fruit through the logistics chain. This includes tasks such as forecasting, rate negotiations, coordinating loading, transport and shipping arrangements and documentation. The overarching objective is to deliver fruit to customers on time and in optimal condition, while carefully managing costs - a complex and demanding responsibility in today's unpredictable logistics environment.

3. Systems

As detailed in Chapter 7, exporters rely on information systems for real-time stock tracking, cost management, grower payments, quality control and claims handling, logistics coordination, and export documentation. Systems like Supply Chain Management (SCM) and Enterprise Resource Planning (ERP) are essential for ensuring smooth coordination among growers, packhouses, cold storage facilities, logistics providers, forwarding agents, and international customers. Systems can also play a vital role in analysing market intelligence to drive marketing decisions.

4. Finance

Financial management is a critical function within fruit export companies, ensuring the business remains solvent, profitable, and compliant. Further to this managing payment risk and ensuring that growers are paid accurately and on time in a transparent manner is vital. Key aspects include maintaining accurate internal accounts to track income, expenses, and profitability across different markets and products. Effective debtors and creditors management is essential - this involves timely invoicing, collecting payments from international buyers, and ensuring prompt settlement of obligations to service providers. Cash flow management is particularly important given the seasonal and high-value nature of fruit exports, requiring careful planning to match income and expenditure across the production and shipping cycle and secure debt finance where necessary. Currency management plays a central role, as most revenue is earned in foreign currency. Finally, financial operations must adhere to strict compliance requirements, including SARS regulations, Reserve Bank exchange control rules, and statutory audit and reporting standards.

5. Commercial

At the core of an export agent's commercial role is the responsibility to serve two primary clients: the **producer** and the **customer**. Acting as the intermediary between them, the exporter's ultimate goal is to ensure the satisfaction of both parties. In many ways, every function performed by the exporter should support this objective. The fresh produce industry is highly relationship-driven, making it essential for exporters to build and maintain strong, trusting relationships with both growers and customers, which requires **high service levels** and **excellent communication**.

Growers and customers often have opposing needs. Growers aim to maximise the price they receive for their produce, while customers (such as supermarket buyers) want high-quality, compliant products at the lowest possible price. Exporters must carefully balance these competing interests to ensure growers remain profitable while meeting customer demands for the right product, delivered on time and at a competitive price. Striking this balance is essential. A satisfied grower continues to invest in quality production. A satisfied customer continues to place orders. Together, this creates the foundation for long-term sustaina bility and profitability in the industry.

Grower and retail buyer

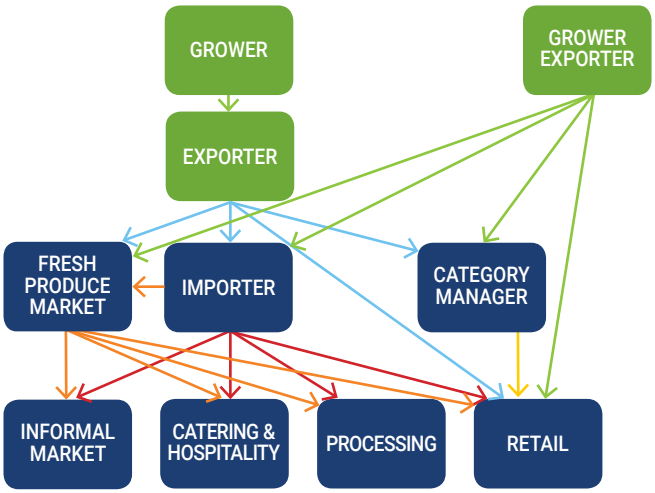
In summary, the exporters commercial role from a bird's eye view includes the following:

- **Procurement/grower relationship management** - The goal is to source the right fruit from growers to meet customer needs while paying consistent, market related prices to growers.
- **Marketing and sales/customer relationship management** - The goal is to build and maintain a diverse customer base to optimise the sale of fruit while maintaining high service levels and building/maintaining an attractive offering.
- **Managing operations** - Managing operations is an ongoing process with many cross-cutting activities. The commercial team will typically take a lead in co-ordinating the various aspects including commercial, technical, logistics, systems and finance. Key activities include:
  - Forecasting and planning
  - Supply and demand matching and managing retail programmes and trading markets
  - Co-ordinating packing and packaging
  - Co-ordinating cold storage
  - Co-ordinating logistics
  - Co-ordinating compliance
  - Stock management
  - Price negotiation
  - Claims management
  - Grower payments

6. Route to Market

The structure of the industry in terms of the flow of fruit to the various key markets is illustrated on the right. The most common model is for growers to supply an export marketing agent who then sells the fruit on behalf of the grower on a commission basis. The exporter has multiple market options including selling directly to the end customer such as a retailer, or going via an intermediary such as an importer, wholesale market or category manager.

STRUCTURE OF THE INDUSTRY



Another model is for growers to export their own fruit rather than use a third-party export marketing agent. These growers are known as grower exporters and have all the same market opportunities as exporters. Grower exporters are typically larger farming operations, often with multiple farms in different geographic regions, who have the critical mass to provide an attractive product offering and who can afford to employ dedicated, full-time staff on the export side of the business.

7. Product pricing

Price discovery is the process by which the market determines the price of fresh produce based on various factors, particularly supply and demand. Price discovery is dynamic and influenced by multiple players and mechanisms across different markets and product categories.

• Supply and demand dynamics

At the heart of price discovery is the balance (or imbalance) between supply and demand influenced by factors such as:

- Global supply conditions, such as crop volumes from South African and competing producing countries (e.g. Chile, Peru and Argentina).
- Local climatic impacts, which affect the size, quality, and timing of South African harvests.
- Seasonal demand patterns in importing countries - such as increased citrus consumption in Europe during winter or peak demand in the Middle East during Ramadan or in China during the Chinese New Year celebrations.
- Prices tend to rise when supply is short or demand is high and fall when markets are oversupplied or demand is weak. Exporters must therefore anticipate and respond to shifting global flows to optimise returns.
- Consumer buying power linked to the state of the economy.

• Role of price makers - large retailers and supermarket chains

In many destination markets, large supermarket groups act as price makers. These retailers:

- Often set fixed or semi-fixed prices through seasonal programmes.
- Demand strict compliance with specifications, certifications, and delivery windows.
- Use their buying power to exert downward pressure on farm-gate prices, especially for standard or high-volume products.

South African exporters who work directly with these retailers may negotiate programme prices pre-season or enter pricing agreements. These prices may not always reflect real-time market conditions but offer predictability and volume stability. Supply to retailers is typically governed by a pre-agreed supply programme and delivery according to programme throughout the season is vital to successful long term supply to retailers.

• Trading and spot markets

In contrast, open trading markets, such as the fresh produce wholesale markets in Rotterdam, Rungis (France), Dubai, and China, operate on a more traditional supply-and-demand basis. Prices are fluid, often negotiated daily or weekly. Traders and importers respond to product quality, arrivals, currency exchange rates, and regional competition. Exporters selling into these markets can potentially achieve higher returns if supply is short - but also risk lower prices in oversupplied conditions. These spot markets play a key role in discovering the “true” market price, especially for surplus volumes or fruit not sold on fixed programmes.

• Other influences on price discovery

- Currency exchange rates can significantly affect export values and competitiveness.
- Logistics and shipping disruptions can cause gluts or shortages, influencing price levels.
- Increases in production costs can drive prices up.
- Market intelligence and benchmarking tools (e.g. price reports from importers, trade platforms) are increasingly used by exporters to assess fair value.

8. Pricing mechanisms

South African fresh produce exporters have several pricing mechanisms at their disposal when negotiating sales into global markets. Each option presents its own level of risk and reward, depending on market conditions, customer relationships, and the type and quality of the fruit. Common pricing methods include:

- consignment sales,
- fixed-price agreements, and
- minimum guarantee pricing.

• Consignment sales

Under consignment, the exporter ships fruit to the receiver (importer or wholesaler), who sells it on behalf of the exporter. The final price is only known once the fruit is sold in-market.

- Pros:
  - Potential for higher returns in strong markets.
  - Receiver motivated to get the best price as it affects both parties.
  - Common for fruit sold into open or wholesale markets (e.g. Netherlands).

- Cons:
  - High price risk - returns can be poor if the market is oversupplied or quality issues arise.
  - Delayed payment - cash flow impact as payment only occurs after sale and deductions.
  - Limited pricing transparency and potential for disputes over deductions or pricing fairness.

• Fixed price sales

In this model, the exporter and buyer agree on a price before shipment. This is often used in retail programmes where buyers want price certainty or in trading markets.

- Pros:
  - Predictable returns - useful for planning and cash flow.
  - Lower risk compared to consignment sales.
  - Often supported by strong, long-term buyer relationships.

- Cons:
  - Exporter may miss out on better prices if the market strengthens after shipment.
  - Requires accurate forecasting of costs and market conditions.
  - Less flexibility to respond to changing market dynamics.

• Minimum Guarantee Price (MGP) + upside share

A hybrid model where the buyer guarantees a base price (the MGP), with any proceeds above that split between buyer and seller based on an agreed formula.

- Pros:
  - Offers downside protection while still allowing for upside potential.
  - Aligns the interests of buyer and seller.
  - Reduces the risk of total loss in weaker markets.

- Cons:
  - Requires strong trust and transparency in accounting.
  - Complex to administer, especially when deductions and variable costs are involved.
  - Disagreements can arise over the calculation of the “upside.”

9. Incoterms

Incoterms (International Commercial Terms) are standardised trade terms published by the ICC (International Chamber of Commerce) that define the responsibilities of buyers and sellers in international transactions. In fresh produce exports, they determine:

- Who arranges and pays for transport, insurance, and clearance.
- Where risk transfers from seller to buyer.
- The chosen Incoterm significantly affects the final fruit price, margin, and risk for the exporter.

Note:

- Incoterms should always be stated when negotiating/agreeing prices.
- Incoterms should always be used in conjunction with a named place, e.g. FCA Cape Town or CIF Rotterdam.
- The preferred Incoterm is often determined by the preference of the buyer and if correctly costed and managed, all Incoterms can be used to the satisfaction of the exporter and grower.

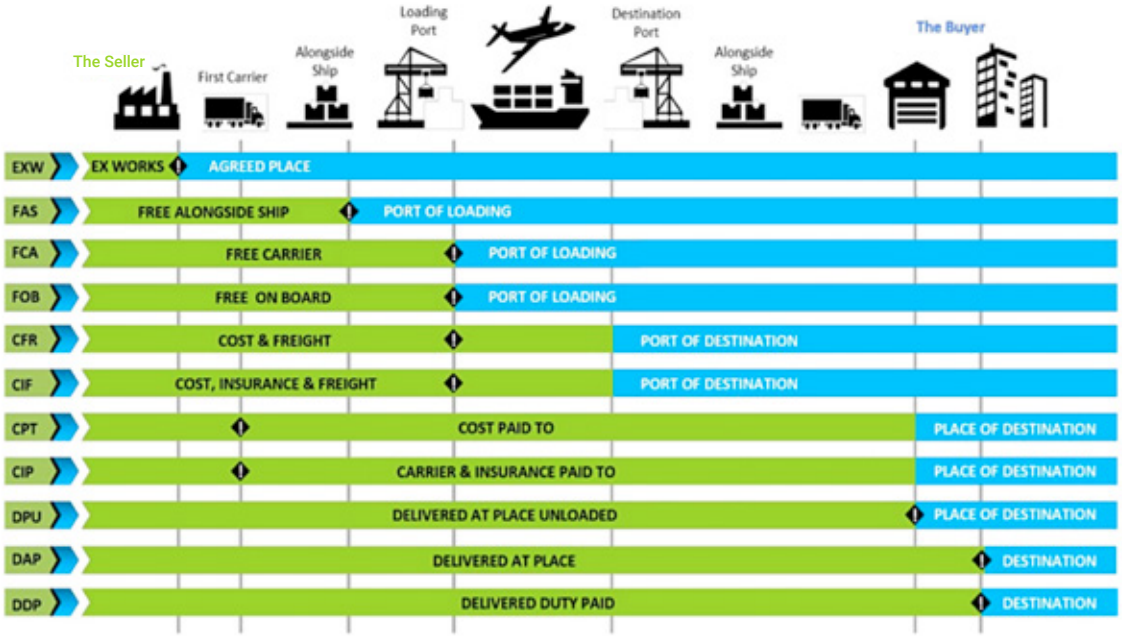
COMMON INCOTERMS USED IN FRESH PRODUCE AND THEIR IMPLICATIONS

Incoterm	Key Characteristics	Pros	Cons
FOB (Free On Board) FCA (Free Carrier)*	Exporter delivers fruit to the vessel at the port of departure. Buyer assumes cost and risk from that point.	- Simple and commonly used. - Exporter avoids overseas risk.	- Limited control over the logistics process.
CIF (Cost, Insurance and Freight)	Exporter pays all costs and carries all risk up to the docking of the vessel in the foreign port and the buyer assumes cost and risk from that point.	- Protects goods in transit. - Often preferred by less experienced buyers.	- Higher costs to exporter. - Limited control post-shipment.
DAP (Delivered at Place) DDP (Delivered Duty Paid)	Exporter delivers goods to buyer's location (e.g. warehouse, market). Exporter bears nearly all costs and risks.	- Full control of logistics.	- High exposure to delays, damages and foreign market costs. - Requires deep logistics expertise.

*Note as mentioned in the logistics chapter that the technically correct incoterm to use when shipping in a specialised reefer vessel is FOB, while the equivalent technically correct incoterm when shipping in a container is FCA.

The chart on the following page illustrates the full list of incoterms with the respective responsibilities of the seller and buyer. The sellers responsibility is shown in green while the buyers responsibility is shown in blue.

INCOTERMS - RESPONSIBILTY MATRIX FOR CONTRACT OF SALE



10. Important Commercial Disciplines

The following disciplines are important for exporters.

- Ensure that signed **contracts** and **Service Level Agreements** are in place pre-season with key players including:
  - **Grower agreements** - Key aspects include: point of delivery, risk transfer, payment terms, claims procedure, supply volumes, commission structure and price pooling rules.*
  - **Customer agreements** - Key aspects include: pricing mechanism, incoterms, quality and packing specifications (typically as an addendum), compliance requirements, claims procedure, payment terms and supply programme (typically as an addendum).
  - Various **Service Level Agreements** with service providers such as; cold stores, logistics and forwarding agents, shipping lines, packhouses, information systems providers and transporters.

*Price pooling refers to a practice where exporters pay growers and average price, typically calculated over multiple customers within one market for a particular grade within a particular week. Where exporters make use of price pooling, they should do so transparently according to rules agreed with growers in advance.

- Make use of **marine insurance** to mitigate against the risk of logistics failures.
- Manage the risk of **payment default** using tools such as **credit guarantee insurance** and **advance payment.**

11. Registration of exporters

As well as the statutory requirements placed on all South African businesses (e.g. company or trust registration with CIPC or the Master of the High Court respectively, registration with SARS as a taxpayer, COIDA registration etc.), the following registrations are mandatory for all South Africa fresh produce exporters:

- Registration with SARS Customs as an exporter. If approved, SARS will issue you with a Customs Client Number (CCN), also known as a Customs Code. This is a legal requirement under the Customs and Excise Act No. 91 of 1964.
- Registration with the Agricultural Produce Agents Council (APAC) as an export marketing agent. This is a legal requirement under Section 9 of the Agricultural Produce Agents Act, 12 of 1992.
- Registration with the Department of Agriculture (DoA) to obtain a Food Business Operator (FBO) code as an exporter. This code is required for export certification and appears on the PPECB inspection certificates and phytosanitary documents issued by DoA.
- Registration with the Perishable Products Export Control Board (PPECB) as an exporter is required in terms of the PPECB Act (No. 9 of 1983) for the issuing of export inspection certificates (refer to chapter 4).
- Pre-season approval is required to export to special markets on DoA's PhytClean platform (refer to chapter 4).

• Fresh Produce Exporters Forum (FPEF) membership is voluntary. It is however greatly beneficial for exporters and further details are available in the following section.

12. Industry coordination

12.1 Fruit South Africa (FruitSA)

FruitSA (Fruit South Africa) plays a vital coordinating and advocacy role in the South African fresh produce export industry. It is a non-profit umbrella body that represents the collective interests of the country's major fruit industry associations, including the Fresh Produce Exporters' Forum (FPEF), Citrus Growers Association (CGA), Hortgro (pome and stone fruit), South African Table Grape Industry (SATI), Subtropical Fruit Growers Association (Avocado's, mangoes and litchis) and BerriesZA (blueberries and other berries). FruitSA engages with government, trade partners, and international stakeholders to promote market access, trade facilitation, and fair regulatory frameworks. It works to ensure that the industry remains globally competitive by supporting transformation, sustainability, and skills development. Additionally, FruitSA plays a vital role in addressing cross-cutting issues such as plant health, logistics, market intelligence, and compliance with international standards, thereby helping to safeguard and grow the reputation of South African fruit in global markets.

FruitSA's ROLE IN THE SOUTH AFRICAN FRUIT UNDUSTRY

CGA, Hortgro, SATI, Subtrop and BerriesZA are commodity organisations which represent the interests of the growers of each respective export commodity. Except for BerriesZA, where membership is voluntary, the rest of the commodity organisations are statutory bodies with mandatory levies. Statutory levies are compulsory payments collected from producers under the Marketing of Agricultural Products Act (No. 47 of 1996). These levies are legally enforced, but industry-driven, meaning they are requested by commodity organisations and approved by the National Agricultural Marketing Council (NAMC) and the Minister of Agriculture for all export growers as legislated by the National Agricultural Marketing Agency (NAMC).

12.2 The Fresh Produce Exporters' Forum (FPEF)

Established in 1998, the Fresh Produce Exporters' Forum (FPEF) is a voluntary, non-profit company and serves as the **official fresh produce export council of South Africa**. It represents stakeholders involved in the **second half of the fruit export value chain**.

Its primary members are **fruit export marketing agents**, while **associate members** include key service providers such as logistics companies, shipping lines, cold storage operators, packaging manufacturers, and systems providers.

The FPEF plays a crucial role in the fruit export sector by performing the following key functions:

- **Facilitating and safeguarding market access** by engaging with both South African and international governments on issues such as **trade barriers** and **Sanitary and Phytosanitary (SPS) measures**.
- **Promoting South African fruit globally**, primarily through exhibiting at major international trade shows and distributing its **official trade directory**, which showcases its members and the products they export.
- **Advocating for an enabling environment** for exporters by working with government and stakeholders to address legislative, infrastructural, and service delivery challenges. A current focus area in this regard is collaborating with **Transnet Port Terminals** to improve port infrastructure and efficiency.
- **Upholding integrity and trust** in the industry through a member **code of conduct** and mediation role, which assures international buyers of the professionalism and reliability of South African exporters.
- **Driving transformation** in the industry by supporting inclusive growth and empowerment initiatives.
- **Supporting innovation and research**, particularly through its **Post-Harvest Innovation (PHI) programme**, which facilitates research to enhance post-harvest handling and product quality.
- Fostering industry collaboration via platforms such as **Joint Marketing Forums (JMFs)**, the **Logistics War Room**, and the **Fruit Industry Value Chain Round Table (FIVCRT)** - a public-private partnership that includes work streams on market access, logistics, and transformation.
- **Industry Training** - This Harvest to Home handbook serves as the FPEFs primary training tool and is also the basis of a 6-day training programme that the FPEF provides as a service to the industry. The FPEF also has a leadership development training programme called the Leadership and Mentorship programme which services as a tool to develop leadership skills in junior to middle management in the industry.

The FPEF currently has **over 170 members**, who collectively account for **more than 90% of South Africa's fresh fruit exports**.

For more information on the South African fresh produce export value chain visit **www.fpef.co.za** or contact info@fpef.co.za.

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Acronyms

AEO Approved Economic Operator
AI Artificial Intelligence
APAC Agricultural Produce Agents Council
AV+ Automatic ventilation
B-BBEE Broad Based Black Economic Empowerment
BRCGS Brand Reputation through Compliance Global Standards
CA Controlled Atmosphere storage
CBS Citrus Black Spot
CD Cargo Dues
CDO Cargo Dues Order
CGA Citrus Growers' Association of Southern Africa
CIF Carriage Insurance Freight
COO Certificate of Origin
CTO Container Terminal Order
CY Container Yard
DoA Department of Agriculture
DC/DCs Distribution Centre(s)
DCA Dynamic Controlled Atmosphere
DAP Delivered At Place
DDP Delivered Duty Paid
dtic Department of Trade, Industry and Competition
EAN European Article Number
ETA Expected Time of Arrival
EXW Ex-works
FBO Food Business Operator code
FCM False Codling Moth
FCA Free Carrier
FIVCRT Fruit Industry Value Chain Round Table
FOB Free on Board
FPEF Fresh Produce Exporters' Forum
FPT Fresh Produce Terminal
GAPs Good Agricultural Practices
GMPs Good Manufacturing Practices
GSP Generalised System of Preferences
HACCP Hazard Analysis and Critical Control Points
Hortgro Statutory primary producer organisation representing pome and stone fruit growers
HORECA Hotel, Restaurant and Catering
ID Identification
IPM Integrated Pest Management
IPPPC International Plant Protection Convention
ISPMS International Standards for Phytosanitary Measures
IT Information Technology
JMF Joint Marketing Forum
LC Letter of Credit
LEAF Linking Environment and Farms
MRLs Maximum Residue Levels
MSC Mediterranean Shipping Company
NFI Net Farm Income
NPPO National Plant Protection Organisation
NPP0ZA National Plant Protection Organisation of South Africa
PHC Pack House Code
PPECB Perishable Products Export Control Board
PTI Pre-trip Inspection (on containers)
PUC Production Unit Codes
QA Quality Assurance
QC Quality Control
RA Regular Atmosphere
RH Relative Humidity
RFid Radio Frequency Identification Tag
RPC Reusable Plastic Container
SABS South Africa Bureau of Standards
RTG Rubber Tyre Gantry Crane
SACCI South African Chamber of Commerce and Industry
SARS South African Revenue Service
SATI South African Table Grape Industry
SI Shipping instruction
SIZA Sustainability Initiative of South Africa
SPS Sanitary and Phytosanitary
SRV Specialised Reefer Vessel
STC Ship to Shore Crane
TDI Truck Distribution Instruction document
TEU Twenty-foot Equivalent Unit
TFR Transnet Freight Rail
THC Terminal Handling Charges
TNPA Transnet National Ports Authority
TOS Terminal Operating System
TPT Transnet Port Terminals
TTT Time-Temperature Tolerance
UK United Kingdom
USA United States of America
USDA United States Department of Agriculture
VAT Value-added Tax
VGM Verified Gross Mass
WCO World Customs Organisation

HARVESTTOHOME

The fresh fruit trade chain

HARVEST TO HOME

fpef fresh produce EXPORTERS' FORUM SOUTH AFRICA

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