HOW IT WAS DONE
The research team observed cold chain practices on fruit farms, in pack houses, in cold stores and at the Cape Town Container Terminal in the Port of Cape Town during the 2012/2013 summer fruit season.

In addition, the researchers conducted 12 temperature trials: one apple, two summer pear, three plum and six table grape trials from different production areas in the Western Cape and Northern Cape. They placed temperature monitors in certain fruit cartons just after the pallets left the cold store to be loaded into the container. The monitors measured the fruit pulp temperatures and/or the ambient temperature and humidity throughout the container’s journey to its overseas destination. The temperature data was e-mailed back for analysis. Although only 42 out of the 74 monitors were retrieved, valuable information was gathered.

THE AIMS OF THE STUDY
“Looking at summer fruit varieties that are exported in containers, we firstly wanted to determine the causes and the extent of breaks in the cold chain in order to minimise or possibly eliminate them,” says Dr Van Dyk.

“The study’s second objective, and final outcome, is a Good Cold Chain Practice Guide to help the fruit industry improve operational procedures, reduce losses and improve the quality of export fruit.” The guide will enhance the South African fruit industry’s international competitiveness and reduce losses and claims, resulting in significant savings for both the industry and logistics operators.

Easier said than done when you are a pear or a bunch of grapes en route from the farm to a supermarket in a foreign country. One break in the chain that holds your looks and flavour together and you could be heading for the compost heap instead of the kitchen table.
For the purposes of the study, a break in the cold chain was defined as any rise in ambient temperature above 2°C for longer than 90 minutes.

**THE FINDINGS**

The researchers found several reasons for breaks in the cold chain:

1. **On the farm**
   - Fruit is picked in high temperatures at midday.
   - Picked fruit waits for a long time in high temperatures to be transported to a pack house.

2. **At the pack house**
   - Insufficient shade at the receiving areas.
   - High temperatures inside the pack house.
   - Fruit is too warm when it is packed.

3. **At the cold store**
   - Due to a lack of airlock loading bays, fruit is left outside under a roof while waiting to be loaded.

4. **At the container terminal**
   - Trucks wait in long queues to enter the port.
   - Containers from cold stores within two hours’ travel time do not have gensets (power source) to maintain the cold chain temperature.

The temperature trial data showed that the difference between ambient and fruit pulp temperatures can be more than 1°C between the pallets close to the refrigeration unit and those at the door of the container. It also confirmed that a container cannot re-cool the fruit and only maintains the pre-cooled temperature.

The extent of the cold chain problem was monitored experienced no breaks. Almost 60% of the cold chain breaks happened at the interface between the cold store and the container truck, and 30% of the breaks occurred between noon and 16:00 – the hottest part of the day. More than 20% of the breaks continued for more than a day.

Dr Van Dyk says that the real solution to the cold chain challenge lies with people. “The cold chain will only improve once all the participants appreciate the impact of temperature on the shelf life of fruit and the important role they play in maintaining the cold chain.” She is confident that the Good Cold Chain Practice Guide will play a role in this process.

**THE LINKS IN THE COLD CHAIN**

The fruit export cold chain starts the moment the fruit is harvested. The freshly picked fruit is pre-cooled in a refrigerated room to remove the field heat – a crucial step to preserve the quality of the fruit.

The pre-cooled fruit is transferred to the pack house where it is sorted and packed. The next stop is the cold store where the packaged fruit is cooled rapidly to its optimum storage temperature (eg, -0,5°C for table grapes) and then kept refrigerated at this temperature until the road trip to the port from where it will be exported. If the load will spend more than two hours on the road, the PPECB prescribes that is has to be transported in a refrigerated ( Reefer) container, fitted with a generator set or in a refrigerated truck.

Once the load reaches the port, the containers are stacked on a loader container yard and plugged into electrical power points. Containers are usually stacked according to the sailing schedule and loading plan of the vessel they will be exported on. Once onboard the vessel, the containers are plugged into the vessel’s electrical power supply.