

4+1 Four manuals, one mission

Perfect fruit perfectly delivered is the holy grail of the fruit export industry. A recently completed project delivered four how-to guides for those who pursue this quest in the citrus cold chain.

“By improving protocols and practices along the cold chain, the citrus industry can prevent losses running into millions of Rands due to waste.”
Hannes Bester

STANDARD POLICIES AND PRACTICES are a cornerstone of the citrus export industry. Every single person who handles the fruit – from picking to packing to point of sale – has to know what he or she is doing and, more importantly, the correct way of doing it.

Hannes Bester is the area extension manager for the southern part of the country at Citrus Research International (CRI), based in Port Elizabeth in the Eastern Cape. Between mid-2011 and mid-2013, he led a project to improve cold chain technology transfer in the citrus industry. The result was four manuals that show employees exactly how to handle the fruit in their



link of the cold chain. These manuals were compiled and updated by Keith Lesar, the extension officer responsible for post-harvest technology transfer in the CRI Extension Department.

Fruit lives and changes until the consumer finally bites into it. What starts out as a tiny nick or bump or blemish, can over time develop into a wound or a disease that will spoil the fruit. No activity in the cold chain is therefore too big or too small to be meticulously controlled. This is why the transfer of skills, knowledge and methods of manufacturing – collectively known as technology transfer – is so important.

Mr Bester describes technology transfer as a powerful tool. “It is a key element in keeping the South African citrus industry globally competitive. If applied properly, it can raise the quality of all the cold chain components to enhance the shelf life of the fruit.”

Although the CRI Post-harvest Technical Forum (CRI-PTF) had manuals and procedures in place previously, the industry agreed that they had to be updated to reflect the latest developments. Funded by the Post-Harvest Innovation Programme, Mr Lesar set out to produce an illustrated post-harvest disease manual, standard operating procedures (SOPs) for pack houses and a decay control checklist, and to update the CRI Production Guidelines. The first three documents are also being included in the CRI Production Guidelines. In this way, the widest possible technology transfer will be accomplished across the supply chain

“Each of the four elements exists as a separate entity,” explains Mr Bester. “But they serve a collective set of objectives.” These are to ensure that citrus is handled within the best time and temperature protocols; that the best practices for fruit handling, packing, palletising and transport are applied; that cooling and humidity are efficiently controlled; that resistance to certain post-harvest fungicides is

managed; that fruit decay is controlled and that good quality packaging materials are used.

The overarching aim is to consistently deliver citrus fruit of superior quality to our markets, at home and abroad. In so doing, the global competitiveness of the South African citrus industry should be improved.

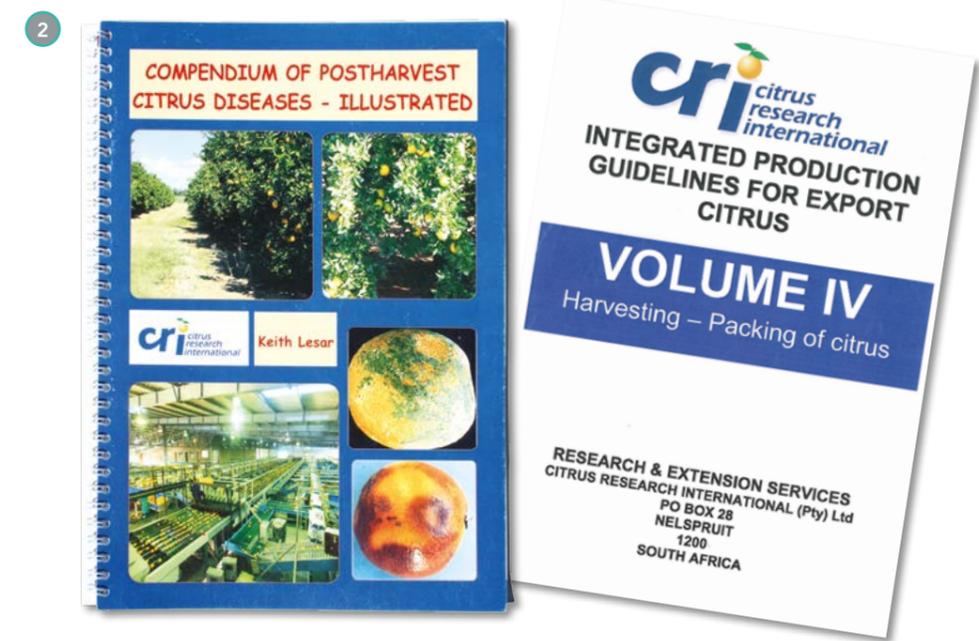
THE FOUR MANUALS

1 Compendium of Post-harvest Citrus Diseases
This illustrated guide assists citrus growers, pack house managers and fruit inspectors at both local ports of departure and international ports of arrival, to correctly identify post-harvest decay and diseases.

Accurate feedback is the important issue here, ➡

KEEPERS OF CITRUS QUALITY

South Africa is one of the largest citrus exporters in the world. The vast citrus industry is tightly structured to ensure proper management. Citrus Research International (CRI) coordinates research and technology with the support of the Citrus Growers’ Association (CGA). There are four departments within CRI: Research, Extension, Cultivar Development and the Citrus Improvement Scheme, with the CRI Post-harvest Technical Forum (CRI-PTF) falling under the Extension Department. The CRI-PTF is responsible for post-harvest technical coordination and technology transfer.



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PROJECT TITLE
Citrus Cold Chain Forum facilitates technology transfer

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DURATION
Two years

PHI-2 CONTRIBUTION
R188 000

LEAD INSTITUTION
Citrus Cold Chain Forum

BENEFICIARY
The citrus industry

FOCUS AREA
Technology/knowledge transfer

PRESENTATIONS AND PAPERS DELIVERED
Eight

1 Hannes Bester.
2 Two of the four manuals that were produced to advance knowledge transfer in the citrus industry.



The South African citrus industry has to contend with between 12 and 14 different types of post-harvest fungal diseases. The majority of the economic losses, between 80% and 90%, are caused by only 23% of the infectious agents, or pathogens, that cause diseases once fruit is in the cold chain.



says Mr Bester. "Locally, export marketing agents often receive reports from fruit inspectors overseas, flagging citrus consignments for waste types such as sour rot, blue and green mould and brown rot. However, on closer inspection we discover that the diseases have been wrongly identified. This makes it very difficult to implement the appropriate and timeous corrective action."

The Compendium of Post-harvest Citrus Diseases was launched at the CRI pack house workshops during January and February 2013 and proved its worth during the year's citrus season. "Industry players tell us that the photos and descriptions helped employees to correctly identify infections at all the critical points along the cold chain, most importantly at the international ports of arrival before the fruit went into the markets for sale," says Mr Bester.

2 Decay Control Checklist for Citrus Pack Houses
Every step of the journey, from orchard to market, plays a role in the control of post-harvest citrus diseases. None of the role-players can undo the harm inflicted on the fruit at a previous step, and each has a duty to deliver a sound product to the next phase.

While pack houses can certainly contribute to quality problems by not having adequate checks and balances in place, they are too often blamed when poor quality products reach the market and financial losses are suffered.

Mr Lesar compiled the pack house checklist

SPREADING THE WORD

Successful knowledge transfer extends beyond the production of documents. Making the industry aware of the tools and training people on how to use them, were important aspects of Keith Lesar's responsibilities. During the two-year duration of the project, he:

- Consulted and paid visits to more than 200 citrus pack houses during the 2011, 2012 and 2013 packing seasons.
- Spoke at the CRI Citrus Symposium every second year, reaching 500+ delegates with the knowledge transfer message.
- Presented to more than 650 delegates at the annual CRI pack house workshops in Limpopo, Mpumalanga, KwaZulu-Natal, Swaziland, Eastern Cape and Western Cape.

Articles about the project and its outcomes were published in *SA Fruit Journal* and in the CRI's electronic newsletter *Cutting Edge*.

by distilling recommendations he gathered from workshops, study group meetings and pack house visits. It is an easy-to-use daily management tool to help manage the critical control points that prevent decay and improve shelf life.

Industry feedback is confirming the usefulness of the checklist. In addition to being a management tool,



pack house managers are using it to manage and record the functioning of the pack house critical control points. They also use it to conduct in-house audits. The checklist can serve a similar auditing purpose for export agents.

3 SOPs for Citrus Pack Houses

The SOPs for pack houses is a shortened version of Volume IV of the Citrus Production Guidelines. The simple format in which it describes best handling procedures and protocols helps to manage the movement of the fruit from the orchard, through the pack house and into the container trucks. It covers, among others, receiving the harvested fruit, drenching the fruit prior to de-greening, pre-sorting, washing and drying, waxing treatment, sizing, packing and palletisation for shipping.

The SOPs are being welcomed by the pack houses as a tool to manage and record their critical control practices and procedures more efficiently. The fact that the pack house manager can repeatedly apply unchanged processes and procedures contributes to a disease-free, high-quality product.

4 Citrus Production Guidelines

The existing Citrus Production Guidelines Volume IV, called Harvesting and Packing of Citrus, has been updated.

Each component of this project targets specific areas



1 Delegates attend a session at the CRI Citrus Symposium.

2 Keith Lesar, the extension officer responsible for post-harvest technology transfer in the CRI Extension Department.

3-4 Thanks to the Post-harvest Diseases of Citrus manual, employees can now correctly identify fruit infections at all the critical points along the cold chain. The images show *Diplodia* stem-end rot on a navel orange [3] and sour rot on soft citrus [4]. Sour rot is caused by a fungus which occurs in the soil of all citrus production areas. Spores are spread by dust and water, splashing from the soil onto low-hanging fruit, and penetrate through damaged sections of the peel. The sour odour associated with the advanced stages of the infection attracts vinegar flies, which can further spread the fungus. Soft citrus varieties, such as mandarins, are particularly susceptible.

