



I&I NSW irrigation officer Jeremy Giddings runs a soils and irrigation workshop for Bhutanese extension staff in Bhutan.



Sharing our citrus success with Bhutan

A group of citrus industry personnel from Bhutan recently toured Australian citrus industry operations to help direct improvements in their own industry.

KEY POINTS:

- Citrus is the most important cash crop to the 670,000 people who live in Bhutan.
- More than 22,000 households in Bhutan's central and southern districts grow mandarins.
- Prior to engagement with Australian scientists, average yields were less than half that of Australian trees.

BY MANDY GYLES

The citrus industry in the small Himalayan country of Bhutan is adopting new strategies to boost production of their biggest export crop, thanks to the assistance of Australian citrus industry experts.

Mandarins are grown by more than 22,000 households in Bhutan, mostly in the central and southern districts of the country, which is on the eastern end of the Himalayas and home to some 670,000 people. Citrus is Bhutan's most valuable export crop, with Bangladesh and India the main market destinations.

Traditional Bhutanese mandarin producers

rarely prune their trees, use few inputs and are faced with pests and diseases such as Chinese citrus fruit fly, powdery mildew and the insect-borne bacterial disease Huanglongbing (HLB). As a result the fruit can be of poor quality, with average yields less than half that of Australian trees.

INTRODUCING NEW TECHNOLOGY

In the past 3 years, the foundations have been laid for the Bhutanese citrus industry to adopt new technologies. This has been achieved with input from citrus personnel at Industry & Investment NSW (I&I NSW) and visits to Australia by Bhutanese research and extension officers for training and exposure to Australian citrus technology and production practices.

The work has been led by Sandra Hardy, citrus industry leader with I&I NSW, in collaboration with Mr Dorjee, national citrus coordinator with the Bhutan Department of Agriculture.

Ms Hardy says the project has exposed the Bhutanese to several management practices

they can use to improve their citrus production. "Early surveys of Bhutanese growers identified opportunities to improve yields through tree pruning, better-timed fertiliser and irrigation applications, and more targeted pest and disease-management strategies.

"Following on from our training and exposure to Australian citrus industry practices, the Bhutanese research and extension staff have been running farmer field days to demonstrate best management practices."

Two demonstration orchards have also been established in Bhutan to show the benefits of canopy management, weed removal and creating basins around the trees for the targeted application of water and fertilisers.

WELCOME CONTRIBUTION

Mr Dorjee says the project's contributions to developing Bhutan's citrus industry are numerous and welcome. "Unlike other projects in our country, the visits by eminent Australian citrus scientists and researchers to Bhutan will have a direct impact on our citrus industry both



Paul Holford, a pathologist from the University of Western Sydney, demonstrates the use of the iodine-starch test to Bhutanese district extension officers on a citrus pest and disease study trip to Bhutan in 2009. The iodine-starch test can be a useful field test for helping to select suspect HLB leaves for further laboratory testing.



(From left) Mr Dorjee, national citrus coordinator with the Bhutan Department of Agriculture, Sandra Hardy, I&I NSW, and Eyles Citrus nursery owner Gary Eyles inspect a citrus tree ready for dispatch.

in terms of technology generation and capacity building of our extension and research officials," he says.

As a result of the technical input provided by I&I NSW, improvements have been made to citrus management, with the project identifying pests and diseases that are affecting crops such as HLB.

"We are also taking steps to improve our citrus nursery practices and tree production techniques," Mr Dorjee says.

RECENT AUSTRALIAN VISIT

A group of senior citrus industry personnel from Bhutan recently toured Australian citrus industry operations on a three-state visit to help direct improvements in their own industry.

In Mildura they visited the Murray Valley Citrus Board, Citrus Australia Ltd, Auscitrus, the Mildura Co-operative Fruit Company and Dareton Agricultural Research and Advisory Station, along with local citrus producers, including an organic producer.

In the Sydney Basin they visited the Elizabeth Macarthur Agricultural Institute, the University of Western Sydney, Sydney Markets and a wholesale citrus nursery. While in Queensland the visitors were hosted by owners of a number of orchards, nurseries and packing sheds in the Mundubbera–Gayndah area.

Mr Dorjee says the group was very interested to see how Australian citrus growers prune their trees because it is one of the main ways they are improving production in Bhutan.

"Traditionally seedling trees are used and growers don't prune their trees at all, so the Australian approach is very different," he says.

AUSCITRUS FOCUS

Members of the Bhutanese group benefited from seeing the operations of Auscitrus—the industry organisation that supplies high-health-status budwood and seeds to the Australian industry—including at Eyles Citrus nursery at Kenthurst, Sydney.

"As well as looking at nursery practices we tried to reinforce how important a scheme like Auscitrus is to the citrus industry in any country," says owner Gary Eyles. "If you are not propagating from clean, true-to-type material then you are starting with a huge disadvantage."

The Bhutanese group could see the potential for introducing this approach. Mr Dorjee says Bhutan wants to introduce the use of clean-grafted citrus trees because they can fruit in 3–4 years. "This is significantly earlier than the seedling trees currently used, which take, on average, 7–8 years to fruit, and sometimes up to 12 years."

A selection of citrus rootstock has been introduced as seed into Bhutan to provide a source of rootstock material for the Bhutanese citrus industry. These rootstocks are being further trialled in Bhutan to assess their performance under the local mandarin variety on a range of soil types.

EXOTIC DISEASE THREATS

An important aspect of the ACIAR project has been research on exotic diseases such as HLB, which is a key threat to Australia's citrus industry.

Through the project, Australian scientists completed a pest and disease survey, collected psyllids (the insect vector of HLB) and diseased

citrus samples. As a result, they identified the agent responsible for the devastating powdery mildew disease that causes mandarin tree dieback and crop loss in Bhutan. Spray trials are assessing the use of sulfur and horticultural mineral oils for the control of powdery mildew in citrus orchards.

"One of the benefits of the project to Australia has been the experience of learning firsthand about these exotic pests and diseases, and the impact they have on commercial citrus orchards," says Graeme Sanderson, an I&I NSW officer who has visited Bhutan several times to pass on his knowledge of the Australian citrus industry.

"These diseases, already present in neighbouring countries like Papua New Guinea and East Timor, are a severe biosecurity risk to Australia."

To assist in the transfer of new knowledge to Bhutanese extension officers and farmers, a simple production guide for mandarin orchards has been developed. It provides guidance on canopy management, nutrition, irrigation, pest and disease management, and harvesting practices. A similar guide is being produced for Australian mandarin growers as part of the project. ■

PARTNER COUNTRY BHUTAN

PROJECT: HORT/2005/142 Improving mandarin production in Bhutan and Australia through the implementation of on-farm best management practices

CONTACT: Sandra Hardy, sandra.hardy@industry.nsw.gov.au; Les Baxter (ACIAR), les.baxter@aciarc.gov.au